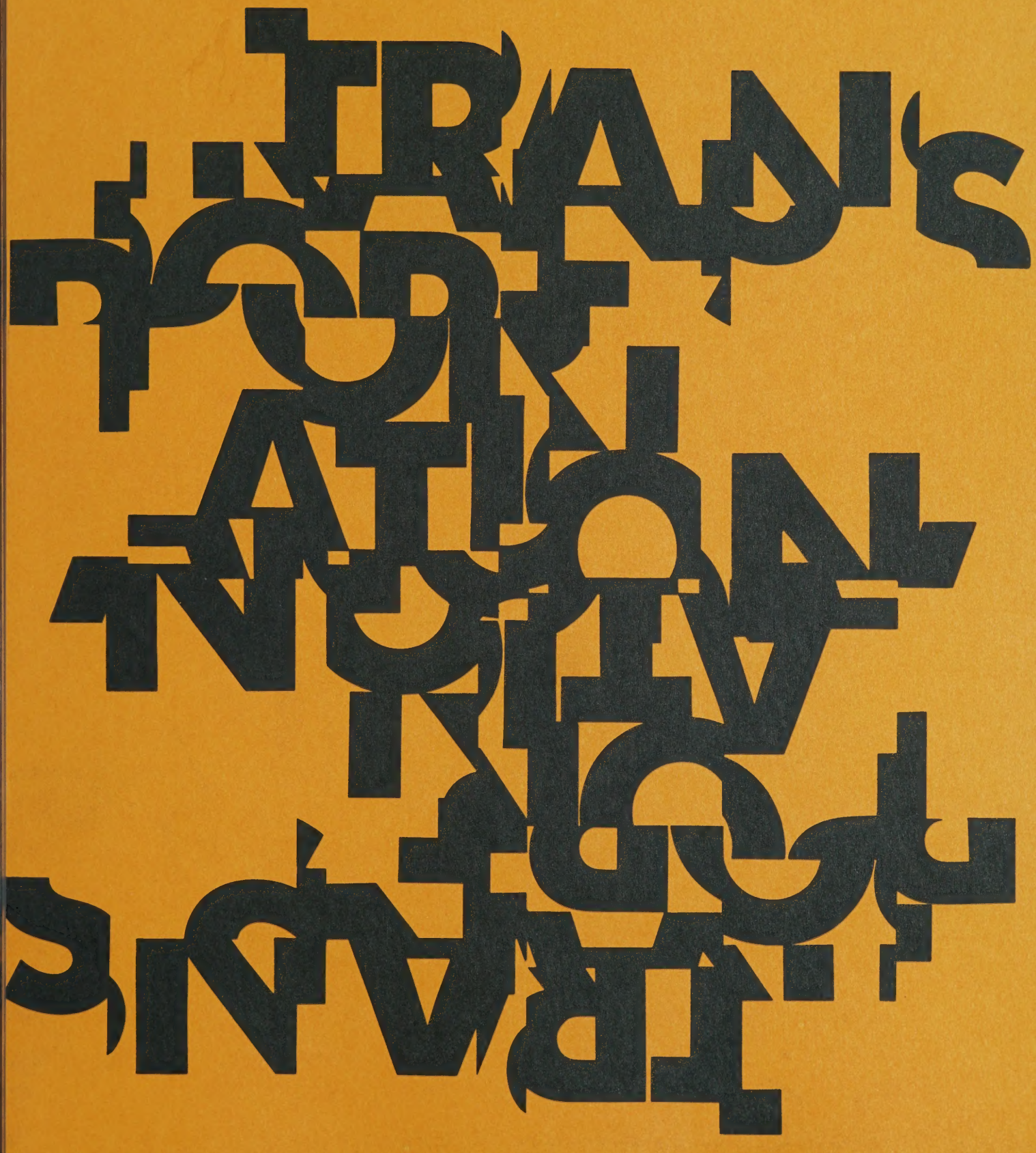
TRANSPORTATION

PROCEEDINGS
OF THE FIFTH
BOSTON ARCHITECTURAL CENTER
LECTURE SERIES 1971



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INTRODUCTION

In the Spring of 1971, the Boston Architectural Center offered a lecture series entitled "Transportation" as a part of its continuing education program. The Series was not a success if measured by the size of the audiences. It was important, however, in view of the material presented, the stature of the lecturers, and the integrity and moral purpose they brought to bear on the subject.

Reflecting on the size of the audience can be a fruitless past-time, except for one reason. It has been charged that architects, to whom the Series was directed, are not interested in Transportation; that architects view the subject as outside their ken; that it, Transportation, is not concerned with building buildings; that the engineers are doing most of the projects connected with transport anyway. The substance of the transcript which follows is an overwhelming rebuttal of that charge!

While the program was the result of the ideas of the entire committee, there are two members whose contributions to the series were invaluable to the development of the program: Peter Chermayeff, Principal and Architect, Cambridge Seven Associates; and Aaron Fleisher, Professor, Massachusetts Institute of Technology School of Architecture and Planning.

Not only did they identify the lecturer, but they also posed the problem so skillfully that the speakers agreed enthusiastically to make a presentation in the Series.

The selection of the speakers and their role is as follows:

Serge Chermayeff keynoted the Series by providing an overview of the problems; sensitizing us to the human values to be assigned to any system of movement. His presentation is an articulate plea for humane systems of transport; open-ended systems including balanced components, places to enjoy - modern agoras; alternating experiences of privacy and community are inherent ingredients in this integrated system of the future. It is not more hardware which America needs he argues, but an understanding of the "third ecology": man's relationship to an urban life. Transport is the major determinant of the form of human settlement.

Chermayeff enjoyed one of the best dialogues with the audience after he completed the formal part of his presentation. It is transcribed in full.

Alan Altschuler, as the political scientist, discussed the strategies for governmental policy and implementation. He provided an excellent summary of the interstate highway program up to the present time. He points out that the highway lobby is not a small group of capitalists, but includes widespread support among small business associated with the oil, automobile, and steel industries - not to mention the general population of automobile owners. Among other observations, he notes that no one would have thought about tearing up the urban landscape in order to develop new highways if it had not been for huge sums of federal aid directed for this purpose. This serves as another reminder of the enormous role played by the Federal Government in determining the form of our environment through the priorities of budgetary allocations.

Archibald Rogers developed the design team method for planning and implementing with the community. In his presentation, he compares urban form and transportation systems, with an organism that consists of a skeleton and the flesh it supports. He points out that the skeleton determines the physical form and, for that reason, requires our attention, as designers and decision-makers. As a result of the difficulty of working on transit with current institutions, he suggests three "lifeboat" institutions to parallel those existing ones:

1) Design Team
2) Decision-Making Team
3) Community Team

He also details a "decision-ladder" for the process:

Alternative Basic Objectives;
Decision to select objective
Design Strategies to achieve objective
Decision to select Strategy
Alternative tactics for implementation
(fine details of design)

David Crane was the Urban Designer in the series providing the tactics (and examples) for design implementation. Crane recognizes the existence of diverse and dichotomous criteria involved in the design of systems of movement. Instead of avoiding them, he confronts them head on when he says that there may be a need to "complexify" rather than simplify the solution.

Crane suggests some of the following design approaches:

1. A staged approach on a regional basis, with testing and feedback along the way in making a continuing evaluation.
2. A diversified design vocabulary; to fit the design to the local environment; to develop a classification system.
3. Comprehensive design criteria for circulation space.
4. Role of the street as a "channel of intelligence."
5. System of movement as a city builder/city destroyer.
6. Movement systems as connectors.

William Seifert's role was to provide the technological overview - the hardware currently available or feasible for development. With meticulous detail, he reviews experimental transport systems, compares their advantages and disadvantages regarding cost and function; and comments on their prospects for success and potential development.

George Wald, the Nobel lauriate in Biology, did not talk about Transportation. He spoke about biology. I will leave it to the reader to draw his own parallels between Wald's biology, contemporary society, and transportation.

Sanford R. Greenfield
Boston Architectural Center, 1971

Transportation Lecture Series Committee:
William Cavanaugh
Harry P. Portnoy
Peter Chermayeff
Aaron Fleisher
Sanford Greenfield
Cranston Rogers

SHAPE OF COMMUNITY

SERGE CHERMAYEFF

CHAIRMAN PORTNOY:

On behalf of the Boston Architectural Center and the Committee on Continuing Education I would like to welcome all of you to the Fifth Annual Boston Architectural Lecture Series. This year's program is devoted to the topic "Transportation."

We hope this lecture series will attempt to explore the aspects of transportation in all its ramifications as systems of movement. Our concern is with transportation as a structuring factor in the design of communities at every scale, from the smallest micro to the larger scale, regional to the corridors in buildings.

The series is concerned with more than the current systems of transportation or transmission as produced by contemporary technology and hopes to encompass wider scope than the public transportation crisis that we face in our urban environments and the need for new systems to solve problems of communication in the larger sense.

We are concerned with social implications of movement of creative planning for change in growth and with our own potential to make better environments so that a place of movement is also conceived as a proper place for human interaction.

To initiate our program which we hope on a grand scale we have with us an individual who really needs no introduction to the architectural profession and the allied professions; Professor Serge Chermayeff was Professor of Architecture at Yale University from 1962 to 1969. He is well-known in the field of Academe as Professor of Architecture at Harvard Graduate School of Design and as President of the Institute of Design in Chicago.

He has had a distinguished career as an architect, as an educator, and has had influence in every respect on students and colleagues. He has been made an honorary Fellow of the Association of Columbian Architects, S.A., a Fellow of the RIB and among some of the things he has done most recently, he has been a publisher of a very important book of "Community and Privacy," and has a new book currently on the press "Shape of Community."

It is with a great deal of pleasure and satisfaction that I present tonight Professor Serge Chermayeff who opens our lecture series with a talk on "The Shape of Community." Professor Chermayeff?

PROF. CHERMAYEFF:

I am going to ask you to bear with me. As has been mentioned already I have just finished a book and as most of you know the kind of book under discussion takes some years to work at, to produce, even with the admirable help of students which I have had, and I have been very fortunate in that.

So, I have an obsession which I cannot get rid of until this book is finally published and you have all bought it and read it and we are all bored with it together. I am going to talk, if I may, in most general terms about what I mean by shape of community, and exactly what is intended by an introduction which really summarized the whole book; namely, that there are some obvious available structuring devices in our existing technological culture of which by far the most obvious, of course, is precisely what has just been stated; namely, the systems of mobility and communication. But as the talk is of transportation, it is quite obvious that we are going to discuss not the implications of communication systems which don't have territorial limitations, but only specifically about those systems of communication which do have territorial implications; namely, access to and from facilities and people.

A few days ago, (it is very interesting that everything becomes topical suddenly in America) a presidential candidate (Senator George McGovern) declared that his priorities included reconstruction of the transportation system, along with rebuilding of our cities, renewing our rural economy and reversing dangerous pollution. Pollution, of course, is fashionable and is being discussed all the time and I am not going to get into that. It is very good news to hear a presidential candidate link urban redevelopment and housing with transportation.

It is particularly cheering because we have also heard in the last few days of the program to restructure government departments in which transportation will be put into the new Department of Economics and problems of urban redevelopment and housing are going to be somewhere else (in something which I think is called human resources) which is the kind of deliberate act of separating linked and integrated (logically speaking) systems which could help us resolve our problems instead of leaving them unrelated, contradictory and aggravating problems.
All this, of course, is due to a very, very simple problem which is plaguing our society; the question of wastage of time-space resources, tearing of nerves, sponsoring of lies, which are all results of a disease which I call "automania" from which the western world under the leadership of the United States, which is particularly hardware prone, is almost dying of right now.

We can say with certainty that if we are going to talk about transportation, we must not talk about random and mostly private mobility which is really extremely costly; even costlier than the "aeromania", a new disease of excess capacity of air carriers who will now provide you for the same price with a mistress somewhere for three weeks in order not to have a vacant seat on the plane. All this, of course, is subsidized out of the public purse.

The real cost, I suggest, and I am not an economist, but some of my economist friends tell me it is a reasonable protest against the successful technology (so-called industrial,) remains unmeasured not only in economic but more importantly in social terms mentioned in the introduction, these latter social terms reaching far deeper than the industrial pollution of the physical environment.

In fact our favorite mode of mobility which we found so seductive may be playing havoc with our basic humanity.

What the ubiquitous automobile does among other things is to tear society apart just like invisible cancer does. We have now any number of stereotyped ghettoes (to suit every purse) springing up in and around our cities. All these isolationists' islands in a sea of tarmach are very much like the very visible oil slick around other shores which is spilling over, growing in its dimension and reach. Our own spillage may be destorying humanity on the shores of our cities. You will gather I am not a suburbanite.

The human consequences of this technological extension has not been really truly examined. It certainly has not been understood and the measure of all such things has not yet been taken.

We have tended to extrapolate everything, as if, merely making more of something and better in any way touches the fundamental problem raised in the first place of why the something should continue to be made. In any case we have to admit that transportation, if we really face it quite honestly as a technique, actually provides an extremely small and infinitely variable part in the whole picture at any given time.

It is quite obvious that techniques obsolesce very fast and they vary infinitely. The notion that we can continue to move around in the same manner if not checked, may become not a variable of a temporary kind, but a constant, destructive evolutionary factor.

I think we have lost sight of the profound difference between communications systems which bring much second-hand information to many without virtually any territorial restraints whatsoever and movement systems which provide access to real events of first-hand experience which involve, of course, response immediately or slowly to the environment with which you have had this confrontation.

What I am talking about, of course, is not extra-territorial, working in fields, it is something which is very earthy indeed if we applied means of measurement which we have, to say population growth, technological costs, and the accompanying automotive automobile number per capita growth in one equation. We might very well conclude that 800 square feet of all available space, whether it be on the actual earth or in the corrugated extensions in our structures, anyhow accessible space which is needed everywhere, always per car owner, is a totally disproportionate burden which already urbanizing society cannot afford. It might be noted parenthetically by the way that all the current talk about cleaning up the car and its fuel will in fact only aggravate every single disease from which we are not suffering immediately. More cars will come into exactly the same places in greater number and it is not the pollution by the car which is painful but the destruction of our habitat. It seems to me, and that is why I accepted this invitation, that nothing is more appropriate at this time than a discussion of such problems which are connected with this vital factor of mobility in modern technological society in a school which is actually dedicated to the improvement of professional standards. This is not a trade school; you are not taught here nuts and bolts, I trust. You come here to refresh yourselves in a relation to purposes rather than techniques.
I will give you a few examples, in order to demonstrate my own priorities and commitment, and remind you of a very dismal record. Nearly four years ago HUD held a conference on urban transportation under the aegis and the help of our old colleague Charles Haar. Some of you were there. Because our institutions are very poorly designed to respond to any crisis other than war; very little or no positive action has in fact resulted.

Last December the House and Senate negotiators (I love the word)--"killed" a miserably inadequate three-quarters of a million appropriation which could have helped cities at that time to meet current transit deficits. A much larger amount of money, of bad money has already been sunk in the redundant SST and probably a much larger amount of good money still may be voted for it.

The Highway Lobby only two weeks ago declared publicly that it needed for the next 15 years $350 billion--that is a little less than the whole of the national debt--in order to feed their juggernaut. There wasn't a murmur from anybody.

Much closer to home, and I say this with all due apologies to my son, involved the proposal for the American bicentennial based on prototype mobility systems which could become both an exhibition and demonstration and an investment. This is extremely unlikely to clear the assorted lobby and institutional hurdles. It is much too realistic in a true sense of that word.
Generally I take a dim view of defoliation of green and pleasant lands. Continuous economic growth leads to more torment for the consumers, more capital for the consumer's paradise. We are not alone. The United Kingdom had a conference which characteristically in the English manner was called "The countryside in 1970". This was held to round out seven years of painstaking and meticulous research work. Not one of the discourses touched more than superficially upon the impact of mobility on that very confined island. Similar painful circumstances, you can add your own catalog of horror.

I would like also to report to you something rather good. Some years ago--Professor Robert Ayre of Yale--he has since left, in Applied Sciences ran a seminar in his school of which he was the Chairman. He had graduate students in engineering and selected college undergraduates in a seminar in which both were thrown together and all students were asked, each one in turn, to present a report on a typical engineering feat of large scale, not in terms of its technology, but in terms of its social impact. This went on for a whole year. It may interest you, although you may not be surprised, to learn that in this exercise the undergraduates came off very, very much better than the graduate students in Applied Sciences; for a very simple reason, that the latter were already far too conditioned to operate in any sensible way.

We have all sorts of options opening up and the observations which I am now going to make quickly, are of compressed and parodied quotes from this book which is still buzzing in my head which is called not only the Shape of Community which is its main title, but has a subtitle called Realization of Human Potential.
I think both are self-explanatory and I hope relevant to the purposes of this lecture series. The title and subtitle, describe my commitment and my environmental priorities.

The various things in relation to transportation such as occur in the book inevitably are all points which are commonly neglected or they are obscured by the ponderous and endless literature of hardware.

I hope that you will bear with me for at least one evening if I speculate about purpose. There is a sort of law which seems to operate in the phenomena of life of all kinds, not excluding mankind, in which maximization of individual choice of environments, events, or interactions is achieved by extending the spectrum of alternatives between tolerable limits of complementary opposites as for instance between community and privacy.

If you live totally exposed in community, history will tell you that the community pays a terrible price. If you live entirely in the isolation of the utmost privacy as a hermit, history will also tell you that you pay a tremendous price for that isolation. There is no consensus

center point which is ideal. That would be a dead center indeed.

What is operating, of course, is the constant process of interaction between compatible complementary opposites. Sometimes you find equilibrium between the two. You can never find equilibrium in an artificially-created situation which is dead center. So, I hope that we may derive our environments and our structures of environments and their designs and their operation from rational choice rather than blind choice. This requires that we have some conceptual structural devices in the first place before we let loose the immense reserves of our technological skills and potentials and resources.

In very, very general terms exploration of any kind by man is guided by human commitment to human ends and these are quite visible and understandable ends or goals of one sort or another. The mutation of human brain in the evolutionary process, remote in time, made it possible for us to imagine that even Cro-Magnon man 34,000 years ago was able to give attention to measuring the seasons.

The most primitive man became the first animal to participate very directly and purposefully in the evolutionary process; but our participation so far has had very mixed results.

The reason for that is, I think, quite clear. We have always had commitments, but we didn't always have the correct priorities in relation to our commitments; but now we see those two things as being essential pieces of this equation.

What we are really doing in broad terms when we talk about "urbanizing" man is a new stage of evolution. I like to think of this man-made environment as a third ecology; the human ecology, which is urban because that is where man is evolving.

Urbanization, therefore, in the broad spectrum of this kind appears to be a very significant step in the evolution of Homo sapiens, the social animal; the animal that has to interact with his own as well as with the man-made environments.

This process is apparently quite similar to every other process, which goes on in any form of evolution; producing natural laws of slow evolution and sudden and yet inexplicable mutations which make our evolution not a smooth curve but a jumpy progress of surprising leaps into the unknown. We are at this moment, of course, in the biggest leap of all; the movement from pre-industrial society into post-industrial society.

We know, of course, in the United States the word urban has really lost any particular meaning as opposed to say rural. There is no such thing. It is simply that we have an infinitely greater exchange between people who are working in "A" field or who are working in "B" field, and both are totally interdependent and as a matter of fact, totally exchangeable, in the long run.

This process of urbanization is creating conditions which are quite, quite different from the classic notion of an urbanized society which is a society of cities. Every single human settlement regardless of its size, intensity, density, frequency of use, whatever measures you like to apply to them, is in fact part of a global urban system in the process of developing as inevitably as the evolution of man himself. An ever greater interaction between these settlements increases their interdependence. This universal interdependence is extremely important not only in relation to the movement systems but in relation to foreign affairs, for example. No matter on what scale, whenever we have a communication system, all human beings regardless of their cultural condition, their educational condition, or economic condition, begin to operate slowly with the same structuring devices and the same capacities to choose their destinies and methods of operation.

I think of all settlements as an enormous hierarchy of places where people are; not necessarily as residents, but simply as users of the accessible space or information of whatever kind for whatever purpose.

If we were to start talking about design of these sort of pieces of our urban environment in this immense hierarchy of settlements and interdependence, communication systems and access systems; namely, transportation, such systems would become prime structuring devices.

I would like to emphasize my priorities and the reason for my mistrust of any kind of continuing adherence to single ideal ubiquitous form of movement. (The car is the nearest thing to this we can now think of.) Everybody has the illusion of total freedom of access to everything provided there is a roadway. Shortly, as a matter of fact, we could have, the abandonment of roads and move around on air cushion, wheelless vehicles of a design which could cross rough terrain. This however would not improve our conditions; it would make it worse, much, much worse.

What is really happening is that because we have random movement so highly developed technically, we are getting what I call territorial anarchy. All these bits and pieces of inhabited places scattered and diffused, served by the private automobile, can only make the provision of extremely standard facilities just as standard as the automotive instruments of mobility themselves. We are getting in fact a stereotyping of our society and we are getting an illusion of choice; whereas, the reality is that we are moving more and more, wasting more and more time in this movement, moving from nowhere to nowhere because we only move to the already preconceived target which is exactly in the same set of targets as the one you have just left. Every shopping center is the same; every parking lot is the same; every point of arrival and departure now is fundamentally stereotyped.

You can have a beauty parlor in any suburb, but you can't find anywhere in a beauty parlor which is a chain beauty parlor anybody but a fashionably-prescribed hairdo such as are of course affected in this room. You already are stereotyped. It is becoming very boring to see the same side whiskers and wigs you know. What is actually happening to us is something exactly the opposite of what we imagine.

We imagine we are getting more individual choice but in fact we are getting less freedom because the mass culture and the mass production systems scattered randomly over low-density concentrations of human beings can only support the stereotyped. It requires a very high concentration, full of ambivalence, uncertainty, mixed intensity, density, frequency of use, to induce the real variety which actually produces choices.

You can get choices, as a matter of fact, along Third Avenue, but I defy you to get a choice in the supermarket, because you have seen it all before and will again in every other supermarket.

What I am talking about is the lack of opportunity to meet other than

preconceived purposes produces stereotyped people. People move from target to target, but they know what they expect before they get there and that is exactly what they get. There is no surprise, no adventure. There is none of the evolutionary pressure which difference variety, mix makes. Therefore, it would seem to me that we could use the structuring device of public transportation mobility to reverse the devisive power of randomly moving automotive vehicles in private hands, heavily subsidized, of course, out of the public purse.

My journey to New Haven in spite of the dollar twenty-five which I subscribed to the toll booths of the Pike to New York, actually is subsidized to a tune of between 4 and $5 car trip out of the public purse to this day.

Now, this is an unbearable burden for the people who don't own cars and who have to travel on the New Haven railroad which doesn't travel. There is a kind of inequity operating here which is taken for granted simply because we are automanic in our view of transportation.

I am hoping that you will challenge my assertions and speculations and we can start some kind of dialogue if you will ask me questions. You can argue then infavour of high cost as applied to transit systems. Technological cost is rising so fast because of its complexity that it requires, as a matter of fact, an immensely heavy turnover of use. Highest technology must have a 24-hour turnover and it must serve the optimum number of people. The measure of its efficiency in terms of not only what it can do, but in terms of how we can pay for it to do it, is intensity, density, frequency of use, and mix of use and so to begin with I would say that the only way that we can possibly benefit from using technological costs is by having transit systems which will shift our stereotyped special-use ghettoes, residential sector, business sector, industrial sector, etc., which none of us can police and certainly not our even $16,000-a-year policemen, because they have to be self-policing.

We have to have mixed zoning so that everything is occupied 24 hours a day to a greater or lesser extent. Can you imagine what happens around the empty garages, around St. Louis Stadium in downtown when there is no game on? You can't walk around there. You would have your throat cut. And this is some of the most precious land that St. Louis has.

I am against peak load targets which result from this kind of indiscriminate use of transportation systems in the wrong place for the wrong reason. You cannot have peak loads in something which really requires a very regular pulse of frequency use throughout the 24 hours, which is really the only consideration, particularly for the poor. I must keep on emphasizing this. We have already got the technology that is necessary and we have the existing rights of way which have been established by our roadway systems. They are not entirely evil. I think our highway systems are marvelous, but I think we must take them over and make them work better than for the very low-carrying capacity that they actually have, and particularly when the carrying capacity of these very efficient flows begins to falter and finally collapse, as you get into high-density targets to which all these flows are directed; namely, our highly-concentrated cities. We could reverse this process.

I am going to make a suggestion which is positive in relation to transit now which has been neglected. If you have a considered hierarchy of transit systems at various speeds, but all achieving an identical, balanced time distance factor; if you wanted to be within five minutes' reach of whatever, then you would be using accelerated motion which is technically achievable. You would still be getting wherever you have to within so many minutes which is really the measure of accessibility. If you only had to wait three minutes or thirty time/ distance/ speed/frequency, then these must be counted in as a differential in this measure.

We all know the famous buses, one every ten minutes. But so many buses which are now frustrated in New York and even in their one-way avenue flows, that they have to proceed in bundles because no bus can stop any more except behind another bus. So, what you do is get fleets of buses at intervals between half an hour and an hour serving the New Yorkers standing shivering in the streets.

Transportation simply doesn't work in this kind of simplicist way. You have to have integrity of mass-transit based upon what this has to do. Which has to meet time-distance-access specifications and particularly for the disadvantaged in our time as a first step.

The kind of transportation that I am now describing does not necessarily do away altogether with the conventional car. It is quite obvious that the further away you get from the high density, the car becomes more and more valuable, because no mass transit system can be maintained in low density over large areas. You get an inverse pattern of complementarity; places where the car really pays off and where the car really does not pay at all and other systems do, and there are many intermediary positions.

I can visualize a hierarchy of exchanges in which every stop in the system is in fact an exchange between passengers arriving and departing at that point for very good reasons and by several different menas.

You could, for instance, make exchanges on many given highways now.

We could say all highways are public-owned rights of way and public air rights. We can bridge a highway which cuts a community asunder with all kinds of catalytic bridges of public services. These could be a school and could be a hospital, a health center. If everybody is within certain walking distance of quick sub-systems which meet there, most of the time for whatever reason, the cleverest fellows in private enterprise would nucleate around this publicly-primed new exchange. Exchange points in a transportation system is not just a way of moving passengers around, it makes people gather together; enjoying first-hand experience at leisure, separated from their machines for that brief moment of time when you see somebody as a man with long hair or short hair or a girl with nice legs or not nice legs; where boy can watch girl. Somewhere you can relax. That is why Americans go thousands of miles in order to sit in piazzas everywhere.

We, on the other hand, treat our streets, the only public places for pedestrians as traffic arteries themselves. You only have to walk down a sidewalk anywhere, to realize that cars receive better treatment than men. Even lovely Boston and Cambridge. What you see are fearful, frenetic passers-by who really loathe everybody they have to brush against in case they fall in the garbage. These are not meeting places, they are just another traffic artery in which people are dehumanized to and become vehicles.

I don't believe it is economical any more, to pursue the path of least possible investment in some undevel-

oped piece of land with the sure knowledge that the public purse will somehow beat a road to the doorsteps at colossal expense to all the people who are not going to use it.

We could invest in exactly the opposite way. We could invest in the most essential substructure with an absolute certainty that the intensity and density and frequency of its use will write it off just as fast as we now write off development costs. This seems to be indisputable, and I think there is some evidence of this in other cities outside this country.

There are theories maybe and there are systems which already exist, but which have not yet been systematically used. What we have to do in talking about transportation is not to discuss the hardware (whether it is a monorail or whatever) but simply what it has to do in terms of new purposes and measures. I think we would come up with entirely new answers. What I am really suggesting is that our fragmented society finds it so difficult to live in community now, because of stereotyping and ghettoization and polarization must find public places which are meeting places. Places in which the privilege of being there and doing whatever it is you are doing there may not be disputed, challenged on the grounds of interference with traffic, where you cannot be a nuisance, where you cannot be told to move on.

In other words, some sort of contemporary Agoras where all kinds of things may happen. There might survive some kind of historic prime special centers in which because of the number of people that want to be there, there will be generated all kinds of surprises and adventures. Surprizing first-hand experience and the extension of choice through meeting the unexpected and not the limitation of choice by only going to that which is already known.

Many years ago I think it was in 1956, a bridge school was very carefully designed as a bridging device, so that two sides of a split community could in fact meet in a freshly designed, extended facility. Bridges could be a university or a regional hospital. If points of transfer can be designed to be of infinite richness as learning places I am against the kind of idealized beautifully-landscaped walk from school to residential sector which eliminates any possibility of a child meeting the adult world until it is too late for him to learn what it is all about.

I want places in which the old and the young and the middle-aged and the workers and the idle all mix together in the most natural way as a daily necessity where we become rehumanized again. If we have a perfect system; that is to say, technically a perfect system, and socially secure, then the easy walking distance which is still the cheapest to ten minutes' reach, that we can use, can then be expanded slowly even for the child, the perambulatory child, because his territory will be increased faster, more safely, and will include much richer experiences than today. If you are poor, until you get a car and a driving license, your experiences are really street corners. If you are the "privileged" suburbanite kid, you are carted around in the back of a station wagon endlessly and miss everything between the targets, whatever they may be.

This is a horrible, horrible way of growing up. I would like learning places and they can only be produced by weaning our children away from the notion that the passport to adulthood is merely a driving license. The passport to adulthood, as a matter of fact, is understanding what the adult responsibilities are and how to behave in an adult way.

I am trying to put transportation, transit systems into such a relationship with meeting places that pedestrians become imperceptibly passengers and can again be seen as persons and not as machine minders behind headlights. That way we may get new Agoras.

I had better stop now. I have a very short perovation, you will be relieved to hear. It is quite evident I hope to you that I am talking of very different sorts of transportation systems than the ones which are currently operating, not because we can't operate them, but because we won't. In a hierarchy of appropriate systems for many conditions must be much more than just merely expedient or sporting. Moving about must not be anxiety creating. Everybody now is concerned with departures and arrivals because they involve us with the disposal of monsters to which, we have been tied by some kind of invisible umbilical cord; such as a Mobil credit card.

I am advocating a system of mobility which can help enlarge access of choice for poor or rich alike. This is terribly important in a democratic system of movement. One of the most humanizing instruments I have known is as a matter of fact, (not in the rush hour of an inadequate system in New York,) but a subway in the morning going--I used to take it to Brooklyn. I got to know an awful lot of New Yorkers that I never would have seen before. Good mobility in a complementary sense is simply the opposite to satisfying tranquility.

We cannot enjoy constant mobility and anxiety created in its wake in the present form. We will have an ever-increasing leisure time which may be forced upon us if we do not plan for it and know what to make of it when it comes. I can imagine even now places where people become, as a matter of habit, peaceful citizens instead of competing consumers; places in which spontaneous events will be made possible and above all in which compassion and tolerance of strangeness may once more play a part; places of escape from forced unanimity and suspicion; places which are self-policing around the clock; inviting places and learning places.

If we cannot create simple things of this kind, we may be facing imminent deterioration as human beings far more terrible, perhaps, than sudden extinction through a nuclear blast.

We shall deteriorate slowly and we shall see our limbs and our organs waste. We can lose our humanity in places which are empty of meaning or surprises, but we must not do this. Thank you.

CHAIRMAN PORTNOY: Thank you, Professor Chermayeff, for a very thought-provoking and stimulating opening lecture on transportation services.

Now, we would like questions from the floor to continue with the thesis he has presented to us this evening.

PROF. CHERMAYEFF: Or to dash it to the ground.

VOICE: Do you perceive your ideas as taking place within the context of an ever-expanding population?

PROF. CHERMAYEFF: Oh, yes, I have outlined an open-ended system. Now, we have concentric transportation systems. We are still treating our system of movement as closed systems. We spread around them all kinds of inconsidered extensions which, put ever greater pressures upon the same territorial capacity.

Transportation must be an open-ended system and that is exactly the reason for having a hierarchical

structure, adjustable in dimensions.

VOICE: What about the problem of having too many choices, for instance, bombarding the population with stimuli choices?

For instance, in the supermarket, the chain of supermarkets you also know the pizza is on the left or the vegetables are on the right or whatever and it seems to reduce frustration, you know, when you walk into the Howard Johnson's you know exactly where the bathroom is and these are target points.

PROF. CHERMAYEFF: Right, pure target. You know what you expect there. You go and get it. But you don't talk to anybody there. God forbid. You are trying to get the hell out.

You know, because the child is squealing in the station wagon, what the situation is there. I am not talking about convenience.

You know, convenience is technically very easy to get. It is just like a toilet, but if you eat the wrong things, you may have to go to the toilet for the wrong reason.

VOICE: It is a problem of reeducation then.

PROF. CHERMAYEFF: Of course.

VOICE: If people see the transportation system as roadways, as conveniences to get from point A to point B--

PROF. CHERMAYEFF: We have got to that point. Roads are convenient at A and possibly not at X. This is a convenience which is increasing travel time for the average American at the rate of about 10 to 15 percent per year. The average American now spends approximately 30 percent of his time in travel directly or indirectly? Do you think that is a good life?

VOICE: In your early part of the lecture you made short reference to the excessive expense on the SST; I put an extra S in there by intent.

PROF. CHERMAYEFF: Very good. I think it suits the subject better.

VOICE: And then also the 350 billion dollars on the highway expense; you passed over that very lightly. What mechanisms would you propose that we as a group of people, as a community, as a nation use to execute the creativity that you recommended this evening?

PROF. CHERMAYEFF: You are asking, of course, not a technical or a professional question; you are asking a political question, and I think this is a very relevant question to ask.

Everybody who recommends in one way or another a major reform in morass of a culture or change in the use of resources of an economy is in fact acting politically.

It is quite obvious that the priorities at the moment are not to increase the convenience relative of something like point naught naught one percent for people who will be able to fly by the supersonic transport, but to shift the priorities to those people who cannot afford, as in Los Angeles, to find employment, because it would take them 3 to 4 hours to change buses to get to it.

There is a question of priorities. I am always appalled when I see programs developed on the basis of what America does best; America produces hardware best.

Now, in a moment of war against enemies this is a wonderful thing. You probably remember--I do certainly--in Roosevelt's second war year he asked for 50,000 planes and everybody said, impossible. What did they produce? 100,000. The next year, 200,000. Excellent under those conditions. We haven't produced a single train since 1930. This is a disgrace, politically speaking. It is not technical, it is not professional.

So, you tell your Congressmen that if he votes for the SST, he will be out, and tell it with 10 million others.

VOICE: I was just going to add, I read the same thing on this 320 billion dollars to put it into perspective; 320 billion dollars was cited in a Washington Post editorial as being enough money to purchase every railroad in the country, operate the trains free for the next 15 years at the level of service of 20 years ago with brand-new equipment and still have enough money left over for inflation and wages.

PROF. CHERMAYEFF: I am sure this is absolutely right. If we took all means of measurement of our acts which are available to us, you know, we could put a model together which would make absolute nonsense of the ponderous statements by pseudo-statesmen about economics and public service and everything else that you can possibly imagine; but we are too lazy and complacent to do it. When we talk about a revolution, I won't really mean everybody is going to man barricades (made presumably out of used cars)--but we are really going to simply act differently in relation to the obvious; that is, the biggest revolution we can stage. There are many interpretations of this by all sorts of wise men. These figures can, you know, prove prevailing folly a hundred times over. You are absolutely correct in citing it.

VOICE: I must come back again in defense of this Roosevelt situation; I can remember many decades ago the Boston Elevated running from Forest Hills to Charlestown and I have used it, as you pointed out, to go to high school, go to the hospital, and to go to the museum back and forth and it was a great place 40 years ago.

Today, it has proven some of the facts which have developed your equations and your thinking; so that, if we cannot be prophetic and say what will happen 30 or 40 years from now, at least we may try, but I would feel that in this people like you who understand this problem so deeply, who could set up mechanisms for the actual execution of these things and not ask us who don't understand the problems to communicate with our representatives; it seems to me that it is, that your answer to this question went deep. I felt that the problem is so great and it is so ramifying, the parameters are so many, and these choice problems are so great that it is your responsibility, it seems to me, to take hold of these situations and really punch them in the nose and try to get them solved; I said try.

PROF. CHERMAYEFF: Well, sir, you know, I welcome this rousing speech. I really do. I think it is an excellent statement, but, you see, the trouble really is that the people who know things are not in the decision-making process.

So, you had better elect some who are. I am not running because I am too old, but there are lots of people in this room who I have no doubt, will know much more and will be running and will be elected. But we must have a theoretical base for political action.

We can't have a hardware base for political action. Politics is not made out of hardware. Hardware is effervescent, obsolescing, and there is only one technology that is the best; that is the latest.

VOICE: I am somewhat bothered by your statement about suburbia. One of the most glaring factors we have is that the communities on the outside of the cities are highly different from each other, not uniform, and in many respects it comes from our land use in these communities and if you take studies like the ones in Philadelphia which show that the difference in the communities out of the city are far greater if you go way out, you have to ask yourself if you must not start from the land use rather than from the transportation.

In other words, you have a differentiation of land use. A community reserved for the young adults and very small children and other communities reserved for the older adults and another reserved for the aged and another reserved for the young adults and there is where your break is.

PROF. CHERMAYEFF: But, you see, sir, you are describing exactly the reasons why I don't like it, because what you have described are our separate and very homogeneous communities and that is what Ganz and a lot of other modern anthropologists of American culture have said again and again; these communities are formed by people who have the same aged children, the same economic levels, the same club interests. They drink exactly the same martinis. They live such a homogeneous life within that their particular ghetto that it is totally separate from any other which you described where they don't drink martinis, where they drink bourbon and the children are older, etc. The fact remains that they gather like to like, and this is what is dehumanizing them.

VOICE: But it is dehumanizing because of the land use.

PROF. CHERMAYEFF: I don't think so. I think you are talking about the zoning. If you simply say that around a major exchange in the transportation system, without naming the system, or subsystem zoning shall be mixed so that within 10 minutes or 15 minutes' reach of this we shall have the poorest class, the richest class, etc., and schools and hospitals and this and that you will have made a new use of territory.

I don't think it is land use exactly; it is a different notion of zoning. It is purpose zoning and not land zoning and this makes an immense difference. It is a basic difference.

VOICE: You seem to be outlining the European approach with new town developments along the transportation corridors.

PROF. CHERMAYEFF: Well, you know, the new towns particularly in England, Holland, are a little different. In England, you know, the new towns have been a series of continuous experiments.

It has not been just a crash program so dear to the American culture. This has been going on for something like starting with 50 years. Garden Cities of Patric Geddes have been experimenting and experimenting and they themselves saw a good reason for plugging them into transportation routes in order to get mix.

The moment that one places something in an "ideal" situation and then linked it to something or another in a vague way, you got a homogenized town and the town is a failure. It is not a town at all. It was just another little suburban concentration. In actuality some became stereotyped before they reached maturity as the notion of town which is mixed and varied, we must have an open-ended system and that is what many Europeans are beginning to do by plugging in these settlements into a free-flow system above all else, where these places become exchanges in a super system with no false autonomy whatsoever.

VOICE: Well, our political system is preventing the development.

PROF. CHERMAYEFF: Of course. Look at New York City. What is New York? Is it New York City or is it the State of New York? New York City stretches its highways and roads and its utilities out to northern Quebec. Its immigrants (native Americans) come from below Savannah and, you know, New York City wastes pollute way down to the Gulf of Mexico.

What are we all talking about; cities and states are arbitrary things; we ought to be talking about regionalism. We ought to be talking about all kinds of comprehensive things. Do you think there is a single senior member of Congress who will go along with you? Some will even rise out of their graves. That is why you need revolution, you see, but it doesn't have to be bloody; that is all I am saying.

VOICE: To many Americans "dehumanization" which this gentleman over here described is less important than a sense of living in the community where everybody is alike and maybe Americans need it.

PROF. CHERMAYEFF: Don't you think as it is a false society; in New York it is not true. When you are in a suburb, you have a sense of separation from many events and you go to a selected target area where you stay until you leave again for another target. In a great city like New York or Chicago, (not Los Angeles) there are villages and there is an Italian quarter and a Chinese one or Negro one and so on, but you could one day cross these borders imperceptibly and you can do it on foot.

My granddaughters on the Mid-East side grew up in a brownstone which my son bought some years back and little girls were always teetering on dangerous window ledges. Opposite was a great big apartment house, the remnant of an Italian district. Those Italian mamas were watching every window because that was their street, and they sent their grandsons to push these little girls back into the safety in a street community on one side of mixed Anglo-Saxons, Irish, Jewish, Russian, etc., and on the other side the Neapolitans Sardinias perhaps. Living in perfect harmony across the width of one street. You see, that is different from Suburbia, very, very different. That is a mix. That is a genuine urbanization. It gives you hope if we can take out the dangerous cars.

VOICE: It seems to me that what we are really talking about is that there is a positive or at least a neutral human condition which makes people want to group together for comfort and convenience which becomes negative when it becomes isolationist; but that is really what the problem is. It is not moving together. That is the problem.

VOICE: It is the isolationism.

PROF. CHERMAYEFF: It is a kind of forced isolationism which is made by this very harsh differentiation between what you can afford as choice and what the other can afford, whereas, the urban mix which is really the natural condition of evolving man does not force those differences. Citizens just take strangeness for granted.

One of the most horrible manifestations of our ghettoization, for instance, are the chains of Holiday Inns or Hiltons all over the world. The

moment an American arrives there, he goes into it in order to meet more Americans. They really want to look at the natives like animals in a zoo, from a safe perch, with some goat fettered below where the natives are. We watch them, never touch them, go back to the Hilton and eat our food.

This portable isolationism is terrifying and it is a reflection of our own home-bred habits which I don't think are in the least inevitable. I am full of hope, you can see. I shan't see the change before I die, but I trust that some of you may catch a glimpse.

VOICE: It may be terrifying, but it is horribly marketable. These hotels that are all the same and everything else in the Suburbia and supermarkets.

PROF. CHERMAYEFF: If you define economic growth as a final measure of successful humanization, I think you and Hilton will get along fine. I can't talk in the Hiltons of this world. That is why I gave up.

VOICE: But the society you picture, this urban society, this small village actually there are fewer surprises than there are in the suburban structure which we have now, because when you get too old in one town and have to move to the next, you have no idea what to expect and part of the alienation comes from the fact he cannot go from one age group to the next and the fact is five years later we will be five years older.

PROF. CHERMAYEFF: Well, I think this is partially true, but, you know, one of the things that frightens me are these kind of living cemeteries which are the refuge of thrown-aside old, south of the border, around Miami where there is nobody under 65 anywhere for miles. Their children and grandchildren seldom come to see them. What would they do?

So, alienation becomes annihilation complete. You become discarded when you become old, or at best go to a place for the old; the "house for the elderly". Where is this? Next to a supermarket. It is not opposite a playground where the old man can go and perhaps babysit for some tired mother and imagine that he is young again. No, it doesn't happen. Very dangerous situations.

Thank you very much for your patience.

TRANSPORTATION POLICY MAKING FOR THE BOSTON AREA

ALAN ALTSCHULER

CHAIRMAN SAPERS: Ladies and gentlemen, if we can draw this meeting to order, tonight Alan Altshuler will speak to you on the subject of a transportation policy for the Boston region.

Mr. Altshuler is a professor at M. I. T. in political science where he has been since 1966. Prior to that he taught in Cornell and was educated at both Cornell and the University of Chicago.

He has written a book on community control which was published last year titled "Community Control: The Black Demand for Participation in Large American Cities." That has little to do with his subject tonight, but as he assured me that was a diversion from his main interest which has been transportation over the past five or six years.

He also has published a book entitled "The City Planning Process: A Political Analysis," and has written articles on transportation and he has a book in progress on federal transportation policy which I think he may finish if we all stop making demands on his time. That is not likely, so it seems to me, for the next five years, but that is something we can look forward to.

On the subject of a transportation policy for the Greater Boston region, I can think back to 1948, those of you who can think back with me who were here then may recall that in that year a publicist named Beal was engaged by the late Paul A. Dever and the late William S. Callahan to launch a program for the public school children of the Commonwealth to demonstrate the virtues to the children and hopefully through the children to their parents of a massive highway construction program for the Commonwealth.

Nothing Mr. Beal contended in his slides which were shown in the schools and in the brochures which were passed out, nothing is more important to the happy and successful growth of this State than to build more and bigger and faster highways on every available patch of land we had. That educational effort in 1948 was financed by the road-building industry and it was heavily financed by the roadbuilding industry and it was heavily financed and it was quite successful.

In twenty years the central artery, the Massachusetts Turnpike polluted air and choked cities and later Alan Altshuler was appointed chairman of the Governor's task force on transportation. Last year that task force under his leadership turned the tide and the forward thrust of highway building in the Commonwealth was at last blunted.

Mr. Altshuler may give some credit for that blunting to Governor Sargent, but it surely was our speaker tonight who persuaded the Governor that he could successfully oppose the highway lobby and win an election in the same year. Blocking highway building in the Commonwealth, of course, doesn't solve the transportation crisis.

I hope tonight when we hear from Mr. Altshuler on a transportation policy for the Boston region, that he will not only indicate to us his experience of the past year and a half in leading the Commonwealth toward an important and significant political decision which has changed the course of thinking in the Commonwealth, political thinking in the Commonwealth on transportation; but that he will as well indicate to all of us what the future holds in his judgement and I assure you his judgement is terribly important to the Governor, what the future holds for transportation policy for us in the short-term ahead. Mr. Altshuler? (Applause.)

MR ALTSHULER: I don't think I can live up to that billing. I am almost tempted to go home right now without talking.

What has happened over the past year is that there has been a change in the philosophic thrust of what the Commonwealth is trying to do within the Boston region. There have been some beginnings taken with respect to the processes by which decisions are to be made, but the critical decisions themselves have not been made yet. I will try to indicate in the next forty-five minutes or so how we came to where we are, and how we may move over the next year or so, without trying to forecast just what the decisions are going to be, because I don't know any more than anyone else does.

The background is terribly important. The most immediate background has to do with how Governor Sargent came to the conclusion that a major change in transportation policy for the Boston region was in order.

The longer term background has to do with what Governor Sargent has done in the past year or so and how it fits within historic and nationwide contexts. So, let's begin with the longer history, and come gradually to the more immediate.

At beginning of the century, of course, there were no automobiles. Transit continued to build its patronage rapidly at least into the 1910's.

Meanwhile, motor vehicle registrations passed the one million mark in 1912. By 1926, motor vehicle registrations totalled 26.7 million. By 1929, there was a wide-spread sense that we were out of balance in the development of the automotive transportation system. Roadbuilding had lagged severely behind the development of the automobile. There was tremendous pressure to provide roads so that people could make optimal use of the enormous investment that they were making in their cars.

The federal government had begun to aid in highway development on a very modest scale in 1916. The motto with which the federal government stepped in was: let's get the farmers out of the mud. The program was substantially a welfare program. It was designed to aid what was then perceived as the most poverty striken large group in the political system.

The family farmer was perceived as cut off from the main stream of American life. The automobile offered a way to bring him in to it, but how could the automobile realize this potential if the roads were mud tracks that were impassable a good portion of the time. Farmers couldn't get their produce to market under those circumstances, either.

Well, there is always a lag as perceived social problems develop. By 1929 there had not been any great amount of roadbuilding, even though roadbuilding in that period consisted primarily of paving over the dirt roads and trails that had developed in previous generations.

Then came the Great Depression and World War II. Virtually, no new roads were built in this period. Further, maintenance of the existing road system was severely neglected. But the number of vehicles didn't increase

significantly during that fifteen-year period, either.

Then, right after the war, Americans burst loose from the constraints of the previous fifteen years. They bought automobiles with a vengeance. By 1955, motor vehicle registrations had doubled, from 30.6 million in 1945 to 61.9 million a decade later.

The product of this explosive growth was a mass base for a massive program of highway development. Collectively, the forces for expanded highway development probably constituted the nation's most powerful domestic lobby in the middle and late 1950's.

They had everything. First, they had the largest industries in the United States. At one point about five years ago, I took a look at the "Fortune" ranking of the largest industrial corporations in the United States. At that time, eleven of the top fifteen were all critically involved in the automobile industry: automobile companies, steel companies, and oil companies. Just below that level one could find many of the suppliers, rubber companies and so on.

Second, in every Congressional district, there were contractors who built roads, there were truckers, there were automobile dealers, there were service station owners, and so on. Many of these small businesses were franchises of the national corporations, and thus they were easily mobilized. Many of the others, such as the truckers and contractors, were highly organized into state and national trade associations. They were also among the heaviest financial contributors to state and local political campaigns.

Finally, there were the automobile clubs and associations, whose constituencies included millions of ordinary automobile owners.

By the 1950's, we had a situation in which about one out of every six Americans earned his living primarily out of automotive industries (which included trucking, highway building, etc.) and in which, for the average American, the largest capital expenditure over the course of a lifetime was on automobiles.

It is usually said that automobiles are the second largest expenditure, but in fact this is misleading. The ordinary person who buys a house, which is generally spoken of as the largest expenditure, finds that over the years that house appreciates in value. His automobile, on the other hand, depreciates rapidly. Over the course of a lifetime, from age twenty-five to sixty-five, let us say, the average American probably expends twenty to forty thousand dollars on automobile depreciation. The individual who buys a house when he is age twenty-five, by contrast, is likely at age sixty-five to sell it for a whopping capital gain. At least, that has been the American experience in recent decades.

So, let there be no mistake about it. This was not simply a small coterie of big capitalists who were putting a highway program over on the country. This component of the highway interest enjoyed very widespread support, both among associated smaller businessmen and employees, and among the general population of automobile owners.

In the early and mid-1950's, our politics focused on the middle class. There was not the preoccupation with the poor that we have today. Consequently, traffic congestion was perceived by many people as one of the most important problems of urban America. The so-called "transportation crisis" was not perceived in terms of the immobility of the poor or anything of this kind; it was rather the crisis of the automobile owner who found himself caught in traffic jams.

The result was that in 1956, in a period when President Eisenhower was pursuing the policy of no new starts in the public works field, he supported the enactment by Congress of the Interstate highway program.

At that time, the Interstate Program carried an estimated cost of twenty-seven billion dollars over fifteen years. Today it is generally estimated to have a probably cost of over eighty billion dollars, and a time span of 22-25 years. The number of miles has grown from 40,000 miles to 42,500.

At the time the Interstate Program was enacted, no one had significant experience in the building of expressways in already built-up areas. Relatively few expressways had been built at all. These, for the most part, had been built across the countryside and around the peripheries of urban areas. Route 128 was one of the most urban, and that was built through open country for the most part. There were specific examples to the contrary, such as Lake Shore Drive in Chicago and the West Side Highway in Manhatten, but there wasn't a great deal of experience of this kind.

Most urban roads and most other roads as well had been laid out prior to the development of the structures on that property. It had been unthinkable to develop a new right of way, tearing up the urban landscape in order to produce new roads, and in fact no one would have thought about doing so over the past fifteen years had it not been for the availability of ninety percent federal aid for this purpose.

A central justification for permitting the road program to go forward as vigorously as it has, at the expense to a substantial degree (in terms of lost patronage) of urban transit, has been that the highway system is economically viable, whereas transit is not. The argument has been that we must go with the trend of the times.

There is some truth in this, but it is important to keep in mind that we use completely different accounting systems to judge the economic viability of expressways by comparison with transit. Over the last fifteen years, eighty percent of federal highway aid has been used to finance the development of an expressway system which at its completion will carry an estimated twenty percent of national traffic.

When we are finished with this program, for a period of twenty to twenty-five years, eighty percent of Federal tax resources from motor vehicle use will have been used to finance the system. People have contributed to the construction of these roads every time they have driven to the grocery store, to the movies, around the corner on their local streets. Everytime they have made a trip on any street or highway they have cast a "vote" in the marketplace for the interstate system. Because they have done that, because they have paid their gasoline taxes, it has been possible for the highway bureaucracies to say this is a self-supporting system.

The committee that recommended the interstate highway system in the mid-fifties was chaired by General Lucius Clay. The Clay Committee, in recommending the Interstate Program, suggested that only eighty-five hundred miles of the system could potentially be financed through tolls. In other words, they recommended against a genuine market system because they judged that only twenty percent of the system could be supported on a market basis. Moreover, five thousand miles of eighty-five hundred miles had already been built: the Pennsylvania Turnpike, the New York Turnpike, the Indiana Turnpike, the Ohio Turnpike, and so on.

The states that built these pre-Interstate toll roads have never been reimbursed for having done so. Thus, the real Interstate Program enacted in 1956 involved not a forty thousand mile system, but rather a thirty-five

thousand mile system (subtracting the five thousand miles that had already been built). Of that thirty-five thousand miles, only thirty-five hundred were potentially supportable out of tolls.

So, if one applied the same criterion to highways that is often applied to transit--that is, can it be supported out of the fare box? --only ten percent of this expressway system was deemed a reasonable financial risk.

Now, transit on the other hand was expected during that period to be a self-supporting proposition out of a farebox. Gradually views have been changing. They changed first beginning forty and fifty years ago in some of the major cities like Boston, but the willingness to subsidize transit has only gradually spread to the rest of the country.

Now, in the years immediately following 1956, as you might expect, a great controversy arose over the proposals to build these interstate expressways in urban areas. Controversies were most intense where the density of urban development was greatest, where the number of people to be dislocated by any given mile of highway was going to be greatest, where the open space that might be threatened by a highway was most precious, and so on.

And these cities were particularly the major cities of the Northeast, along with a few of the cities that had been settled relatively early in other parts of the country, like San Francisco and New Orleans.

The primary response of the highway agencies was to delay the construction of these controversial roads, to say to the local officials, "If you don't want the roads, let's just wait; things will work themselves out in time. We will build in other parts of the state for the time being." This was a threat which ended a good many local roads controversies, because businessmen were saying, "We need these roads. Please don't make waves, because the highway department will take the money and build somewhere else; it will be another ten years before we get our highways, and think of what the costs to our economy will be."

Where the controversies were sufficiently intense, however, this line of argument was often insufficient to turn the political tide. The highway agencies, moreover, had a stake in building the cheaper mileage during this period, because the primary measure of highway department accomplishment, as measured by the Federal Bureau of Public Roads, was proportion of the system in construction or completed. The measurement was by miles rather than dollars. Therefore, if an agency could build the less expensive miles first, it could find itself quickly with twenty or thirty percent of the system in construction, perhaps representing only five or ten percent of the dollars.

By the middle and late 1960's, a number of factors were bringing these controversies to a head. One was that we were moving toward the completion of the Interstate system; highway agencies were reaching a point where they could no longer defer their urban mileage if they were to maintain their momentum toward completion.

Second, a learning process had been going on in the urban areas. This process was related to several other major developments of the late fifties and early sixties. One such development was the Civil Rights movement and the trend toward militant mass action as a way of bringing about governmental behavior that was desired by groups of people.

During the late fifties and early sixties, the urban renewal program had become the subject of much of this militancy. The word got around. The grapevine among inner city communities showed itself to be quite effective. It reported that urban renewal programs were very often designed to remove the poor, particularly the black poor, in order to provide high value sites for real estate developers, perhaps to the benefit of the local tax base, but to the harm of the people who lived in these communities. Consequently, when the urban renewal authorities came to such communities by the early sixties, with all of their arguments showing how renewal was in the general public interest, the residents were ready with class warfare explanations of the renewal schemes. Urban renewal as a clearance program ground to a halt all over the country. Renewal turned first into a rehabilitation program, and in the late sixties into a social service program, under the Model Cities banner.

The highway program came in for this treatment next. It constituted a more substantial threat to such communities, in that it promised to dislocate a great many more people, an estimated million people during the entire Interstate program. The highway program also had much less flexibility in terms of siting projects. The highway system requires a certain element of connectivity, whereas urban renewal projects can be plunked down here and there. Moreover, there is little opportunity to change a highway program from a housing demolition program into a housing rehabilitation program.

By the late 1960's then, the new political militancy, as applied to urban public works programs, began to be felt with full force in the highway arena, this at just the time the highway departments were trying to ram through the most controversial portions of the Interstate system.

It was in this context that Governor Sargent took office in January 1969. Governor Sargent had been Commissioner of Public Works (the state highway commissioner) for several years just before he became Lieutenant Governor in 1967. He had also been a conservationist. He was an architect by training. He had been Commissioner of Natural Resources in the 1950's when President Kennedy had offered him the directorship of the National Park Service. He had reconciled these two roles as DPW Commissioner primarily by trying to build the most cosmetic possible highways. He had not really questioned the desireability of the highways. He had pressed hard for good design, but he had been quite persuaded that the highways represented progress. Some people were hurt by progress, and that was regretable, but you really could not strangle progress because some people were hurt.

Coming into office, however, he recognized that this was one of the most intense controversies in the Boston area, one that was going to require some evidence of responsiveness on his part. There were great numbers of people concerned. They were most immediately concerned with the Cambridge Inner Belt, which had brought forth the nucleus of the anti-highway movement in the Boston area, but they were by no means exclusviely concerned with the Inner Belt. There were also people on the Governor's staff who were urging him to take a fresh look. And he is a very open man.

In May of 1969, following numerous demonstrations, and after casting around a bit for a viable approach to dealing with this issue, the Governor announced in a major speech that he was going to appoint a citizens' task force on transportation. He said that he would ask them to address the question of whether the highway program for the Boston region took

adequate account of housing and neighborhood values, environmental values, the values of citizen participation and responsiveness to citizen tastes, and so on.

I wouldn't say that this was the highest priority thing on the Governor's agenda at that point, because it wasn't until August that his office approached me to become chairman of the task force on transportation.

I accepted with some reluctance, and only after the Governor assured me that he really was serious about this. He had serious doubts about whether it was going to be possible to reassess the existing Interstate plans which had so much momentum behind them, but he was willing to consider it, and he was extremely anxious to establish a planning and organizational structure with the capacity to produce much better plans for the future.

Well, the task force began work on about October 1 of 1969 In the manner of modern task forces, it became radicalized rather quickly. We listened to the anti-highway groups and we spent a great deal of time with the public agency staffs, trying to get them to explain the basis of their plans. In this respect, it is important to keep in mind that the task force was composed of transportation professionals. It was composed of people who represented a variety of professional perspectives, and who presumably shared something of the Governor's basic philosophy on transportation matters, at least in terms of wanting a humane and broadly-oriented transportation policy. But none of its members had been active in previous transportation controversies.

Members of the task force ranged in professional orientation from social scientists, like myself, to several engineers, a number of businessmen, an architect, and a biologist who was concerned particularly with public environmental matters. The businessmen had had transportation experience themselves. One was John McGee, executive vice-president of the Arthur D. Little Company, who had been involved in numerous transportation studies. McGee brought basically a system analysis approach to urban transportation planning. Another, Robert Leventhal, was a partner in one of the largest real estate development firms in town. The third, Frank Lindsay, president of ITEK Corporation, had in the early stages of his career been concerned with a number of transportation studies. He had also manifested a broad interest in public policy questions throughout his career.

Well, by the end of December, the task force was unanimous in its judgment that the plans were simply not adequate to justify going forward at that point. We were not reviewing all of the highway plans in the region at that point. We were focusing on the projects which were closest to going into construction: the Southwest Expressway, the Inner Belt, and the Route 2 extension through Somerville and Cambridge. (The Route 2 extension is not an interstate project and was not scheduled to go into construction for quite a few years, but it was so intimately linked with the Inner Belt that we had to consider them simultaneously.)

We recommended that the Governor cease design and landtaking in connection with these projects, and that he initiate a comprehensive review of plans and transportation needs for the area within Route 128. The review, we urged, should focus particularly on what ought to be done about these links, in the context of what ought to be done generally about transportation in the Boston region.

Well, to our surprise, the Governor bought these recommendations. He decided to do what we recommended. He also accepted our view that the planning review could not be carried out effectively by any of the existing agencies, because they all had strong modal biases, specialized responsibilities, and impassioned commitments to the plans they had developed over the previous thirty years.

It may be worth pointing out that the Interstate plans really had developed over a thirty-year period, not just in Boston but all the country. Initially the Interstate program was a WPA-type public works idea in the late 1930's. It was revived again in 1944 and '45, as part of planning for the expected post-war deparession. The state highway departments were asked to lay out their portions of the system very quickly in 1945 and 1946. When the depression did not appear, some more money was laid out for studies, and in the late 1940's state highway departments all over the country came out with master highway plans. The Master Highway Plan for the Boston region came out in 1948. Implementation, for the most part, awaited enactment of the Federal Aid-Highway Act of 1956.

The only group that we felt could effectively carry on a fresh study was one that was directly responsive to the Governor himself and in sympathy with the policy that he had chosen to adopt. The Governor turned around and asked me if I would direct the planning review. I had expected to be in and out of government on an unpaid basis as task force chairman in a six-month period. Having agreed to the Governor's request, however, here I am a year and a half later, more deeply involved than ever.

A number of highway segments beyond the initial three have been brought within the projected scope of the planning review since the Task Force first reported early in 1970. All in all, there are probably about forty miles of proposed expressways covered now. If you went to build them, these miles would probably cost between a billion and a billion and a half dollars to construct. Associated with these highway projects are some major transit projects, whose designs at least will depend very critically on what the highway decisions are. These transit projects will probably cost another half a billion dollars or close to it to build. So we are talking about a two billion dollar set of projects for this relatively small area within Route 128, on all of which the decisions have to be made fairly quickly.

The Governor has committed himself publicly to making all these decisions within eighteen months of the time that we can get a contractor working.

He has committed himself to making a number of basic decisions about whether to build or not to build within twelve months. In fact, most of the basic build versus no build decisions will probably be made within twelve months of the commencement of the study.

Where are we at the moment? Well, it took us a number of months to really get going last year, but during the four months August through November 1970, we put together a detailed work program for the Boston Transportation Planning Review. What we did during this period was to lay the ground work for a new planning process in the Boston area, a planning process which is incarnated in the Boston Transportation Planning Review, but which is thought of as a prototype for all urban transportation planning in the Commonwealth, and which quite a few federal officials are viewing today as a prototype of transportation planning for the nation.

It is probably the most participatory transportation planning process in the country. It is a regional process, so that it really is unfeasible to give

local government or neighborhood ultimate control.

What is feasible, however, is to open the process wide to the most intensive kind of advisory citizen participation, trying to insure that the ways in which the process is carried out, and the people who carry it out, are highly responsive to what the sentiments of the region are.

The basic structure is this. We began very early in this four-month period to establish something called a Steering Group of the Boston Transportation Planning Review. The Steering Group is tri-partite in nature. Its state component includes representatives of about nine state agencies, whose interests range from administration and finance to highways, transit, housing, recreation, natural resources, and so on. Second, it includes representatives of about twelve local governments that have been fairly deeply involved in this process to date. Third, it includes private group representatives. During the study design phase, the participating private groups fell primarily into three categories: one, the anti-highway neighborhood protest associations; two, the good government and environmental groups ranging from the League of Women Voters to the Sierra Club; and third, Chambers of Commerce.

The participatory aspect of the Planning Review is not a voting process; it is advisory. We have developed an understanding that if overwhelming majority sentiment emerges on any issue, I will make every effort, as director of the Review, to abide by it. Where consensus is lacking, our commitment is at least to be completely open, so that everyone will know exactly what is happening and everyone will have a full opportunity to be heard.

We are not going to allow the process to be paralyzed by disagreement. The Governor believes that, although there may be public majorities on the substance of particular disputes, there is also a very large majority in the region that wants government to govern. The public rightly expects its elected officials to choose. The aim, then, is to combine those two objectives of responsiveness and decisiveness.

During the study design phase it was possible to accommodate a variety of different points of view in each situation, because the primary task was setting out the options to be studied. In each case, it was possible to consider examining three or four options, which would range from the building of no expressways at all to full implementation of the DPW plans, which normally call for six and eight-lane expressways.

The Review will be concerned with much more than simply whether to build given facilities. It will focus as well on developing the most sensitive possible designs for the projects being considered, and the most sensitive possible programs to ameliorate and offset any adverse impacts of the projects. In this respect, recent developments have been favorable. Federal policy has been moving very rapidly to give us leverage in the financing of ameliorative programs. Within the past two months Congress has passed legislation making it possible to use highway money to build replacement housing. It will be recalled that the Governor said a year ago that he would not allow another mile of highway to be built in the Boston area unless he was in a position to provide adequate replacement housing for those displaced.

The new Federal legislation authorizes up to a fifteen thousand dollar subsidy to provide comparable relocation or replacement housing for those displaced. Thus, if a project displaces a man who lives in a fifteen thousand dollar home, it is possible to spend up to thirty thousand dollars, if necessary, to provide comparably replacement housing for him. Similarly, recent Federal environmental legislation puts great pressure on the highway officials to accede to requests by governors, mayors, etc. to spend very large sums on environmental protection.

Now, none of this is to say that the most sensitive possible designs and programs to offset the harmful effects of roads will be sufficient to make the roads desireable. The aim, rather, is to analyze whether or not to build even as we strive to develop the most effective possible designs and integrated plans.

When we speak of integrated planning, we have in mind the integration of highway and transit planning with one another, with general land use planning, with housing and environmental planning, etc.

One of the things the Task Force was most appalled by in its review of a year and a half ago was that the state agency which had responsibility for planning expressways had no responsibility at all for planning the local and arterial streets near the interchanges of those expressways, or the parking system to handle the traffic that was going to be brought in by those expressways, or the interfaces between those expressways and transit lines.

This wasn't the fault of the Department of Public Works. It was rather a product of the way in which responsibility had been divided in the Commonwealth. It was most unfortunate, nonetheless, because transportation is an integrated system, and it doesn't do much good to ride at sixty miles an hour on an expressway until you are three miles from the heart of downtown if, when you get off that expressway, you travel at two miles an hour for the remaining miles.

The critical problem in any modern expressway system is the interchanges, and it was the interchanges that no one was thinking about very seriously. This was quite something to be concerned about, because the Boston street system already was not working.

From 1954 to 1964, years for which we have pretty good counts, the total number of people entering downtown each weekday barely changed. The proportion entering by transit fell from forty-five percent to thirty-one percent.

If one projected the highway plans to 1990, it was quite conceivable that the automobile share would continue to rise, and that the transit share would fall to 15 or 20 percent by 1990. There were severe questions about what the impact of such a development would be on the Boston street system, the parking systems, transit deficits, and so on. No one, we discovered, had seriously examined these questions.

The Planning Review is intended to provide the basis for transportation decisions which do take adequate account of such questions.

Perhaps I should emphasize that the Planning Review itself will not produce the final decisions. The Planning Review task will be to develop and fully analyze a couple of major options in each decision situation, and then to throw these options up to the Governor for choice. The analyses that go with each option should deal not simply with user benefits and direct dollar costs, but also with the region's other values, and with all the evidence available as to be to the tastes and desires of the region's residents.

At the moment, we are awaiting a decision by the U. S. Department of Transportation as to whether it will

fund the Planning Review. We have requested $3.5 million dollars (including the state share, which would probably be about 20-25%). A decision is apparently imminent. (Ed. Note: Secretary Volpe and Governor Sargent jointly announced a decision to fund the Planning Review at the full amount requested on February 26, 1971.)

In the meantime, we are working on the assumption that the Planning Review will be funded. A prime contract competition is currently in progress, and we anticipate a designation of the prime contractor sometime in March. Financial negotiations will follow, and the Planning Review should finally get under way in late spring or early summer. Within a year from this point, it is anticipated that Governor Sargent will make several of the most critical go or no go decisions on the major projects up for review.

Sometime this spring, moreover, the Governor will be appointing the Commonwealth's first Secretary of Transportation. In this appointment, the Governor will have a chance to demonstrate the extent to which he is serious about the Planning Review, and determined to use it as a basis for transportation policy-making in the region. I am very hopeful that someone will be appointed who is committed to the thrust of the policy that the Governor has charted over the past year.

I think this might be a good place to break off and turn to questions.

THE CHAIRMAN: Thank you very much, Mr. Altshuler. It has been an interesting and thorough exposition of how we came to this point.

Now we have questions. Before we launch into questions, I think it is fair to say to you that there is at least a rumor in the City of Boston that Mr. Altshuler may be one of those persons considered for that very important post as Secretary of Transportation and Construction, so that when you ask your questions tonight, I hope you are going to do it with a sense of admission here that this may be the man who controls transportation policy for the next four years and you better not let him get out of this room without hearing your views because, of course, once he takes the office, it might be too late.

So, I hope your questions tonight will be challenging and concise. Sir?

MR ALTSHULER: Just keep in mind that while I may have received the nod from Mr. Sapers, I haven't received it from Governor Sargent. Yes, sir?

VOICE: You mentioned about checks and balances on a state level; are you looking into what role the local governments should have as far as the checks and balances of what is happening within their own community?

MR ALTSHULER: Would you elaborate just a bit on what you mean by checks and balances?

VOICE: Well, I'm really concerned with the mode of transportation which is the airport authority and which the city government has no control in the checks and balances and in fact the Governor doesn't have any role in the system of checks and balances because there is no checks and balances on the Port Authority.

MR. ALTSHULER: Well, you happen to touch on an issue that is particularly hot right now.

My task force dealt only in fairly cursory fashion with the problems of intercity transportation. We concentrated on intra-urban transportation, but in our brief treatment of intercity transportation we recommended that the Governor appoint a new task force. The reason we made this recommendation was that my task force was exhausted. I had told a group of extraordinarily busy men that they had a six-months' commitment which we would try to hold down on their part to maybe half a day a week, since it was an unpaid activity. The time required per week had grown substantially, and the number of months had grown to nine. It was clear that this group of men wanted to be relieved. The Governor accepted our recommendation, and appointed an intercity task force, of which I am a member but not chairman. The new task force did not really get underway until after the election. Somehow it was difficult to arouse people's enthusiasm in the month or two before the election about making a report for which there might not be a client following the election. During the two months following the election the inter-city task force did seriously review the problems posed by the Port Authority's proposal to let two hundred and ten million dollars worth of bonds for Logan Airport extension.

A couple of weeks ago the inter-city task force submitted its report to the Governor on the proposed expansion program. The report has not been released at this time, but it has leaked. I suppose it is fairly well known that the task force took a somewhat dim view of simply allowing the Port Authority to go ahead with this investment.

The Governor has no legal power with respect to the Port Authority, but I think that his political clout is substantial. He is conducting a very intensive review of the task force's recommendations, looking toward, I think, a public announcement within the next few weeks. I'm not sure exactly what that announcement will be.

VOICE: But in the Legislature on this department are you working on any setup for checks and balances of the local community affected by, say, an interstate highway or even a rapid transit?

MR. ALTSHULER: We are <u>not</u> going to the point of giving each locality a veto. We <u>are</u> saying that the localities should have a major participatory role in the planning process; that indeed all the potentially affected parties should have the opportunity to review emerging proposals from the start, before official positions begin to harden.

The issues are regional and extremely local at the same time. For example, the East Boston interest in Logan Airport is very important, but so is the interest of the region in having access to other regions. One simply cannot say <u>prima facie</u> that in every dispute one of these interests has to prevail and the other has to give in.

The Governor is not willing to give away his ultimate authority to be the arbiter of regional versus local interests. What he is saying is that he wants all of the interested parties to have adequate opportunity to participate in the process of advising him on what he ought to do.

VOICE: What would be the role of the Secretary of Transportation and Construction to such things as the Port Authority and the MTA, the MBTA, whatever they call it now, as sort of a rider to that, are there alternatives to the MBTA; that is, do we have to accept it as a structure or can it somehow be integrated more realistically into the total transportation?

MR. ALTSHULER: When you ask what the relationship will be, I have to answer in two parts. There is the reorganization act that the Legislature passed in 1969, and then there is a transportation reorganization bill that senior members of the joint legislative committee on transportation have recently filed.

VOICE: Does this negate the other?

MR. ALTSHULER: No, but it builds upon it. It fleshes it out. The reorganization bill that the Legislature passed two years ago creates the new secretaries, and gives them planning, coordination, and budgetary review power over the agencies within their jurisdiction. It does not give them full line authority over these agencies, however. The power of the new secretaries is going to depend very fundamentally on the extent to which the Governor backs them, and uses his power to bolster theirs, because their inherent power is really quite meager.

Now, the reorganization bill that is currently in the hopper takes reorganization, in the field of transportation, a major step further. It would make the secretary the legal chief executive of the DPW and MBTA, with freedom to delegate back to the operating chiefs of these agencies as he deems advisable. With respect to the Port and Turnpike Authorities, there are obligations to the existing bond holders which make it unfeasible at this point to abolish their boards, or to designate the secretary as their legal chief executive. What is proposed, therefore, is one, that the secretary should have veto power over any new capital investments which he deems to be undesireable in terms of integrated transportation planning; and second, that the secretary should be a member ex-officio of each of the boards of those agencies.

VOICE: I would like to ask, will the Secretary of Transportation have the authority to make decisions in the future, is that correct?

MR. ALTSHULER: Well, that depends a great deal on the Great and General Court of Massachusetts.

VOICE: I am from Wayland and I represent the League of Women Voters and we are studying transportation in our area at the moment and we are finding that there is great disagreement in various towns of western suburban areas as to their needs and wishes on transportation and my members wanted me to ask if it was possible for a professional study to be made of our area similar to the one that you have made in Boston.

We are concerned about uncontrolled construction of highways, uncontrolled and unsightly commercial development, no long-range planning whatsoever as to land use and we are afraid that give us twenty years that we will be in the same mess that Boston is in now.

Now, we are at the point where we can make decisions for the future. We don't have to let it happen, but what do we do?

MR. ALTSHULER: Well, I am not in a position to make commitments for any new studies, you understand.

VOICE: We feel that we still have options. We are not locked in and that we would benefit from a professional study.

MR. ALTSHULER: I think it is very important.

VOICE: Before we get ruined.

MR. ALTSHULER: I think it is very important that we carry the concept of the Boston Transportation Planning Review outside of the area.

VOICE: What could we do perhaps to get this done? Who would pay for it?

MR. ALTSHULER: There are federal monies combined with state monies which can support these things. There is a highway planning and research program that is funded roughly three-quarters by the federal government, one-quarter by the state every year.

There is a slight problem in the immediate future in that the really great decisions that have to be made on transportation within the Commonwealth over the next two years are these decisions on the area inside Route 128.

If one looks at the interstate program, the controversial projects are all within Route 128. Most of the controversies outside the Route 128 area are not interstate projects.

VOICE: I will tell you what precipitated this. It was construction of I-290 which we are calling it and now the towns along 495 desperately want to know, we say, do we need it?

MR. ALTSHULER: The strategy I would recommend is that, when the Governor designates a Secretary of Transportation, he should be approached on this. At the same time, I think one does have to recognize that a great deal of planning money has now been committed to deciding what to do about these two billion dollars worth of projects within the Boston area. Anything that goes on elsewhere in the state during this period is going to have to be somewhat smaller scale because of the resources that are absorbed in that effort.

VOICE: We have spent a lot of time discussing the general inter-state type free accessway and the question I had, it seems to me, some of these are being considered closely for roads which could be less than access freeways.

In other words, just having roads with limited access and in other words, is not as much barrier to me for a local expressway. The arrangement that is considered for the interstate highway is tremendous and the amount of space they take is tremendous, too, and I know when Route 52, up to the Worcester County, they are taking a tremendous amount of land for this, when I can't see that they can justify the number of cars from that, for instance, where you would get on 128 where it is a seaboard highway and I wonder is this new commission that is going to be formed, is this going to study all forms, all the arterial modes or is mainly this going to be on the interstate type?

MR. ALTSHULER: No, it will look at options, but it has to operate within constraints that are set by federal policy. These constraints are not absolute, but they involve very important financial incentives.

The major incentive here is that if you build an interstate expressway that has been scheduled, you can get ninety percent federal aid to do it. If you do not build an interstate expressway, you get no substitute money at all, not a penny.

It is not too likely, therefore, that the planning review will propose an arterial street instead of an expressway. It would be more likely to focus on whether a major road facility is needed at all, or on whether an expressway at smaller scale might do the job.

VOICE: Do you see any adverse implication in the recent decisions on the part of federal government Department of Transportation into the Philadelphia waterfront where after a very careful and agreed upon planning process by the city architects, local communities, they developed the concept of the multiple use of decking over a major highway facility and the decking cost which would allow for parks, continuity of uses of both sides of the roads and a variety of other beneficial community things which was to cost an additional fifty million dollars and the final crunch two or three weeks ago the Department of Transportation turned it down and said no fifty million for the additional uses and is there any implication for the things happening in Boston?

MR. ALTSHULER: There may be indeed implications. I think what we have to do in such a case is to decide at what point it becomes worthwhile to build the highway.

I think there are certain circumstances in which you would want to build virtually any highway, if you could tunnel it under the ground, if you could tie it into underground parking facilities, if the vehicles wouldn't have to get out on the street, and so forth. It is rarely possible to have such amenity, however. What the Governor has to decide, based on the analyses he gets out of the Boston Transportation Planning Review, is how much has to be done before he will be prepared to build.

VOICE: The current situation on the so-called highway fund within the Commonwealth, I would like maybe to get some idea of what perhaps this new Secretary of Transportation will have for control over these right now.

THE CHAIRMAN: Can everybody hear that? The question is what the new secretary can do about the highway fund?

VOICE: What the communities now within the metropolitan area, certainly my own feeling is and I think it is general, is that we don't need more highways, but yet we represent more than fifty percent of the population and the money that we pay in taxes that goes into this highway fund cannot be used for anything but highways.

When and will the Secretary of Transportation have the authority to release this for mass transit so we can use our own tax money?

MR. ALTSHULER: He doesn't have authority to do that, because it is a state constitutional provision. The task force recommended last year, and the Governor accepted the recommendation, that we should press for an amendment to the Constitution to permit the use of the gas tax funds for mass transit. On third reading in the Joint Constitutional Convention, an absolute majority rather than a simple majority of those present and voting was required. We got a simple majority, but failed by eight votes of the absolute majority because twenty legislators took a walk, unwilling to be recorded either way.

My own feeling is that, with proper legislative strategy, one can get that amendment through. I think the major change needed is to guarantee the rest of the state that it won't be subsidizing the Boston region. That this really is a home rule matter to enable the Boston region to use its taxes to support . . .

VOICE: Practically speaking, we have been supporting the western part of the state for the highway programs and they won't let us use our own money for our own needs.

MR. ALTSHULER: Sure, it will take some time.

VOICE: You mentioned some immediate action is going to be taken on the transportation routes coming around Boston as to the interchanges and can you tell us what those things are that are affected by the interchanges?

MR. ALTSHULER: Well, I don't think I said we have something immediate to do about the interchanges; I said that, in planning the expressway system, the most critical component is how the interchanges work. The critical weakness in the planning of expressways to date has been that no one has really asked whether the streets adjoining the interchanges have sufficient capacity to accommodate the traffic that is going to be spewing forth.

VOICE: I think you mentioned that generally, in what you just said, but then the last part of it you said that some immediate action was going to be taken on the routes, some routes that are coming into Boston with the interchanges.

MR. ALTSHULER: No, I don't think I said that. I think what I said was simply that the Governor was committed to making the basic decisions as quickly as possible.

VOICE: Concerning the I-495 coming in where the Inner Belt is connecting to the Mystic River Bridge right now, do you--which agency, if any, or the new secretary--will have planning consideration for the reaction to that dumping of that five thousand cars per hour onto an already overcrowded Mystic River Bridge, you know, the alternate.

MR. ALTSHULER: There is no question but that this is a planning disaster.

It is typical of the way in which this planning has been done. It has all been planning from the outside in. In other words, you just plan the roads from the outside, seeking to accommodate all who might want to gain access, without wondering what happens when they get inside. The basic problem has been created by the decision to bring I-95 and I-93 into the Central Artery. We can do a little fiddling with a Leverett Circle facility to try to unsort the traffic a bit, but the basic problem is insoluble.

VOICE: You mentioned that as a result of the Governor's refusal to continue building roads without monies to relocate housing, the federal government reacted to that by releasing monies?

MR. ALTSHULER: No, I didn't say that.

VOICE: Well, I am wondering if as a result of your studies federal action on the federal highway standards might be changed to permit many super highways to enable the states to get the federal financing for less than super highway design?

MR. ALTSHULER: Well, I think there are many, many things happening. The Governor has been quite active, I might say, as part of a national lobby of mayors and governors in trying to bring about major changes along these lines, such as the replacement housing legislation last year, and bills to allow the use of highway funds for transit purposes.

Every year there is some loosening up. Now you can use highway funds for express bus lanes, for bus terminals, for creating waiting places for bus patrons, for improved signalization systems that might give priority to buses in traffic streams, for parking projects at transit stations, etc.

The Governor has proposed and Secretary Volpe has indicated support for, the idea of letting the states decide what they want to do with their highway money.

Secretary Volpe said about a month ago that he thought that there may be some cities in the country where it will prove politically unfeasible to complete the interstate system, and that maybe those cities ought to get some special transit aid. These things may develop over the next year or year and a half, as we are conducting the study. If they do, they will influence the Governor's options, giving him greater flexibility than he has, but one can't be a prophet at this stage.

VOICE: This undertaking by your committee on this balanced transportation program is a very interesting program inasmuch as I think this is the first attempt where a group is going to have the opportunity to evaluate the different modes of travel within an area.

In the past many attempts and many comprehensive studies were undertaken going way back to the Whitten report back in 1929 right up to the '62 reports, but each one of them recommended the fact that there was a need for a balanced transportation system and the need for a modal split in terms of transportation requirements and it is going to be interesting to see whether or not the Department of Transportation is going to support your program in this endeavor inasmuch as it might establish a precedent that may be cleared through in other areas of the country because as far back as last year, one year ago, the MBTA had a two hundred and fifty million dollar bond issue and that was turned down by the State Legislature and it is going to be interesting to see how these programs and the recommendations of these groups are going to be implemented in the State and unless this new Secretary of Transportation is going to be able to put all these pieces together, all modes of transportation and have some jurisdiction, you are going to have the same problem again.

MR. ALTSHULER: It is not simply a matter of increasing the power of the Secretary of Transportation. It is rather a question of what legislators both here and in Washington will permit him to do, and what the public is willing to permit him to do.

As you point out quite correctly, the Legislature turned down the MBTA's bonding request last year. That wasn't quite as serious as what the impact would be this year. Last year the argument was that we don't have to pass the bonding request until the federal legislation is passed, making federal matching grants available. After the Legislature adjourned, Congress passed the transit bill. Now there is federal transit money waiting if we can get the State bonding authority. I think that if the Legislature refuses to pass the bonding bill this year, then when the Governor comes to make his decisions next year, it is going to be very difficult to carry forward with the theme of shifting the emphasis towards transit.

VOICE: An interesting point came up on a couple of issues and they may tie in here. You have a situation where, getting back to authorities, they, the Massachusetts Port Authority in particular, will float in the next few weeks or in the next month a two hundred and ten million dollar bond issue and this can be unchecked and if they go ahead with expansion of the airport, then wouldn't this almost obligate the Governor to construct I-95 bypass to alleviate the traffic from Logan that will be depositing it into Boston and how do you control this situation?

MR. ALTSHULER: I wouldn't say it would force the Governor to do that. I think it would tend to bring an additional element of pressure to bear on the Governor to do that.

Let me say that we are taking very seriously the implications of what this two hundred and ten million dollar bond issue will be. I don't think the Port Authority is going to float those bonds without consulting very closely with the Governor. The Governor may either choose to stop it, or to propose some very important conditions on the new investments. I think we have to wait and see on it.

VOICE: What was the original task force evaluation of the EMRPP, its limitations specifically, and how do you hope to avoid those limitations in the study?

THE CHAIRMAN: Will you explain the initials?

MR. ALTSHULER: Eastern Massachusetts Regional Planning Project. I think that the basic criticisms were those that I have developed throughout this whole presentation, together with one other: namely, that it failed to consider no-build options. Although the EMRPP tested options, every one of them involved either this basic expressway plan or this basic expressway plan plus.

They likewise, of course, didn't have responsibility for integrated transportation planning. What you had really with EMRPP was that the MBTA did transit planning, and DPW did highway planning. At the end, the two sets of plans were put into a single book, and that was called balanced transportation planning.

VOICE: Did you have any reaction to their reasons for throwing away two of their models? They had four possible land use models and they threw two of them away before they even went very far into them.

MR ALTSHULER: We didn't get deeply involved in that. We were primarily concerned not with doing a critical history of transportation of the region, but rather with evaluating the plans that the DPW wanted to go with at this point, evaluating them in the light of our understanding of what enlightened transportation planning seemed to mean around the country.

VOICE: Is there any danger or is there money that has been appropriated now by the federal government for, for example, the continuation of 95 that is in danger of being lost?

MR. ALTSHULER: I don't think so. The Congress has set some critical deadlines for the Governor in making his decisions, and the Governor has made it clear publicly he will make these decisions on time.

The basic deadline for making a go/or no-go commitment on any highway link in the interstate system is June 30, 1973; the basic date for securing approval of final plans, specifications, and estimates is June 30, 1975.

Now, the 1975 deadline is perhaps a tougher deadline than the 1973 deadline because of the period it takes to design a road.

There are two ways in which one can think about dealing with that. One is that we hope to have the basic go/no-go decisions during 1972, which means that there will be three years or so available for the design, should that be needed. This much time will not be needed where the decision is that we can go with something similar to the designs which we have already. Secretary Volpe has had his staff analyze our capacity to meet the deadlines, in the context of his need to decide whether to fund the Planning Review. I think he is basically satisfied that we can meet these deadlines.

THE CHAIRMAN: I will yield to an asserted view to the contrary that this might be the right time to move to the other room and have coffee and Professor Altshuler will stay, I trust, and will be able to answer further questions informally. Thank you very much.

HIGHWAY AND COMMUNITY

ARCHIBALD ROGERS

CHAIRMAN SHEPLEY: Ladies and gentlemen, we are very happy tonight to have with us Mr. Archibald Rogers of the firm of Rogers, Taliaferro, Kostritsky, Lamb, Incorporated, of Baltimore, speaking to us.

I have just had a very pleasant dinner with Mr. Rogers and we haven't talked a bit about what he is going to talk about tonight. I'm sure we are all looking forward to hearing from him; and without further ado, I would like to introduce Mr. Archibald Rogers.

MR. ROGERS: I assume the subject tonight was deemed appropriate for me because I have somehow inherited a funny title--"Father of the Design Concept Team." I am not sure that I haven't produced a bastard, if I am indeed its father. In any case, this experiment goes back to 1966, representing an effort to develop a new approach to the planning and the designing of urban freeways.

I can't say this effort has been really successful so far, but in the course of it I learned something about urban freeways and highways. I learned a great deal more about the processes of decision-making in one community at least, Baltimore. I learned rather early on that the architect was not very credible to the decision maker. Out of this real-world experience has evolved a theory which is being increasingly applied in our office and elsewhere, including DOT in Washington.

"The Highway and Community" implies a very appropriate marriage. The highway is simply one element of the overall transportation system or transportation skeleton and it is this skeleton which in fact determines the physical form and the function of its dependent community.

But the marriage has been stormy. The decisions that lead to designing and putting in place this skeleton are highly controversial, highly political (in a "good" sense) and, until very recently, far beyond the control of the affected community. It is this counterpoint that I would like to play for you tonight, partly architectural design, involving a very important area of city building; partly political design--how do we professionals get into this mainstream. Out of this counterpoint we may begin to develop an approach to city building and to city rebuilding at a scale which gets us out of the specialized box of whatever we mean by urban design as distinct from whatever we mean by planning as distinct from whatever we mean by architecture and its supporting disciplines.

I will start with the physical side of the highway. Here I will be dealing with the urban transportation system of which the highway is but one element.

I have no doubt at all that the freeway is going to be with us for a long, long time as will the automobile. I have equally no doubt that it is going to have a lot of competition from other modes of movement. Nevertheless, if we take an honest look at the urban form as we see it and ask where we have put our main emphasis, I think we have to answer that it has been on its flesh and not on its skeleton.

Certainly we architects have been notoriously guilty of this. We have concerned ourselves with bits and pieces (and sometimes very beautiful and very large bits and pieces) of the architectural flesh. We have in consequence allowed the skeleton to become what it visually is in most of our cities--here in Boston and elsewhere--the meanest piece of public architecture that exists.

We must reverse this order of emphasis. I suggest that the proper role of the architect and the designer is in fact the design of the public skeleton for this is how we shape our urban artifact in its three dimensional form. We shape it also qualitatively by making our public skeleton the very best of architecture, not only in a functional and practical sense, but in the sense of civic art.

And if we accept this, I then go the next step and suggest that we should not really be all that concerned about what happens to the flesh around it. Maybe this should be thought of as malleable; as responsive to change; as something which is underdesigned and understated; as almost an organic and simple animal reaction to the initial design of the structure on which it depends.

And if this is accepted, I think we begin to get a new view of the role of the designer, very different from the role we perhaps have been taught and perhaps are still being taught. The designer treats with the whole. He is a participant rather than an aloof observer--if you will, a worker within the decision-making process working to bring about the design conceived. He, therefore, is not building his reputation by headlines achieved from concentrating his talents and efforts only on the pieces that flesh out the whole.

I don't think this is at all a very radical proposition. As I see the old cities abroad, my reading is that they were not so much the products of a great generation of architects, but quite the contrary, they were the products of a great society which indeed did marvelous things with the design of its public armature--so marvelous that you are not conscious of the rather ordinary flesh around it.

If we are talking about the next two decades in this country, and the imperative of building new and rebuilding old cities (and I think that this is an imperative), the question really is not whether this will be done (for it simply will be done because the resources are there and the market is there). The question is instead whether it will be done better and in a different way from that which we have produced so far. If this question is to be answered in any hopeful way at all, it requires our understanding of the situation that we now are in in this country.

It is hard to describe our situation. Yet despite the bombing of the capitol and so on ad nauseam, I have very high hopes. I believe that we have today the same opportunity that England and Italy had at the end of the medieval period--the opportunity to lead Western society into a new age and in the process to develop for our nation its first golden age (for we have not had one yet).

I think we are seeing today the poignant death of the Renaissance, although we architects assume its death some time ago, when Christopher Wren died. I believe what we are experiencing is a kind of cultural shock due to the collapse of a great system of values which has been the philosophic cement for 500 years of Western society. This system is being challenged today, producing a sort of a cultural orgasm. Out of this clash hopefully will come a new set of values, a new system, a new philosophic cement (if we are creative and sensitive) which should then bring on the next great age which historians no doubt would compare with the Renaissance and the Medieval periods.

So, we find ourselves in our country in our time first of all responding to this cultural crisis. And we are at the focal point of this crisis which is

a worldwide phenomenon. I believe that despite this crisis and the chaos that results, we have also the opportunity to create a new set of values focusing within the United States.

A second and coincidental issue is that we are the world's first post-industrial society. Now, this has very little to do with Western civilization as such, but it carries within it its own set of strains and its own new problems. These derive from our effort to adjust to change.

The key to our particular times is the fact of change. God knows there has been change since Homo sapiens first walked our earth, but today's change is characterized by a pace and a scale that I do not think has ever before been faced. And it is this that has created qualitatively a totally new situation.

Our times, for example, are labeled by the physician not as the computer age, but as the chemical age. By this I think he alludes to the widespread use of drugs--of television, liquor, and you name it--any of a number of marvelously available narcotics to help human beings artificially adapt to change that is occurring at such a pace and scale that they cannot genetically adapt to it. And this is a frightening statement.

In the recent past perhaps one big change would occur, spanning three or four generations. Yet most of us in this room have experienced one or two or three such wrenching changes in our own generation. Our institutions bear the brunt of this, even such a sacred institution as the family. Margaret Meade, for example, questions the longevity of the family as an institution. Yet it, and something we call neighborhood, have been the very building blocks of our society. They are the conventional units around which we plan our urban fabric. And today the neighborhood too is in question. Neighborhood can be thought of in a physical sense, yes, but it is essentially a social concept. It implies geographic roots, whereas in most neighborhoods today, in our larger urban areas at least, you can prdict practically a total change in occupancy over ten years as new families move in and others move out. Is neighborhood really a valid concept given this kind of social and physical mobility?

Well, this is intended to do no more than set the perspective for addressing the central issue--the design of the new communities, and the redesign of the old communities, that must be accomplished over the next 20 years. If these communities are to be well designed, are to be humane, are to be adaptable to change, are to be first statements in the physical evolution of our golden age, our first step has, I think, to be a negative one.

This is to undo the institutions that are so rooted in the Renaissance that they are incapable of change and of moving forward into the new age. It is through these institutions, both public and private, in most of our cities that the forms of these cities are actually determined. If we speak of the architects as an "institution," it is pretty minor in determining this form, more so than other professional "institutions." And if we look at the institutions of government today, I cannot rationally defend them. No doubt they performed well and honorably in the past, but they are disconnected from the problems of today.

Nor can I rationally suggest that they simply be destroyed with nothing to put in their place. This would seem to leave, therefore, a third alternative, and one which has certainly worked well in the past--that the institutions be amended. Yet I doubt that this is possible. I don't think we can amend our institutions with sufficient speed so that they have any hope of catching up with the pace of change. I think they will always be ten laps behind.

The only feasible alternative, the fourth alternative, may be what is known as the "lifeboat" concept. This assumes that the old institutions are doomed; that they cannot and will not self-destruct; that we should, therefore, be experimenting with new institutions to perform the services abdicated by the old ones--in other words with "lifeboats." We are going to lose some of them, but some of our lifeboats are going to float and these become very graceful bail-out devices for those who man the old institutions. It is in this context of new institutional lifeboats or parallel institutions that the design team was proposed.

It was never intended to be simply the architect horning in on the special field of the highway engineer, although the engineers tended to think of it that way.

It was instead thought of as a new institution which because it was multidisciplinary, because it was not a single profession or a single designer doing his thing, would force its client to respond in new ways. And indeed this did happen and some of this forcing resulted in "blood in the gutters." The design team, then, to replace an engineering firm or an architectural firm or what have you, was to be but the first of three new parallel institutions. None of the three really threatens any existing institution except to the extent that it succeeds.

The second of these institutions, which is inseparable from the design team, is what might be called the decision-making team. It is composed of the authorities, as they exist today--of single purpose agencies coming together as a body and acting and reacting corporately to the fully dimensioned proposals of the design team.

The third, and I think most important of these new institutions, is what I call the community team.

There is, therefore, a team of three teams. Each has its special characteristics; each can be specially tailored to fit the particular project, be it a highway project or even a software problem to be solved; each has its role to play.

The role of the design team is to imagine; to evaluate its imaginings; to present all imagined alternatives clearly (and hopefully graphically) to the decision making team. Now, this is very different from the process we are used to as architects. We are used to posing our alternatives and quickly screening them and saying that "this is best." Our client never sees the ones we scratched.

The characteristic of the decision-making team is essentially power. Its members are potentates. They have legal power and financial resources and political power. The design team is, by contrast, powerless. The duty of the decision-making team is, therefore, in the course of making its decisions, first to make "whole" decisions among the alternatives. By whole decisions I mean not just saying "I like that piece of my program best, so let's do that alternative and forget its other parts." Secondly, to make decisions that are true decision, which represent not just an aloof appraisal of what is best or worst, but which recognizes that when an alternative is selected the members of the decision-making team are, individually and corporately, thereby committed to implement it.

The third team, the community team, also has power, but is essentially empowered with a negative veto. This is what Mayor Wagner meant, I think, when he perhaps prematurely stepped down as Mayor of New York. He said his city was no longer governable. That statement, I think, was grossly

misunderstood as describing problems that had grown so large or so harsh that no one could cope with them.

What he may have meant instead was that the constituent communities of Greater New York had become so sophisticated and so cynical that anything City Hall proposed they opposed. They had become capable of stopping anything. Yet they were inherently incapable of putting anything in its place. In effect a great stalemate had evolved. I think it perhaps still continues in most of our large cities.

Okay, how then do we turn this negative stalemate around into some positive movement?

The most likely lever is that which makes a major change in the seen and felt environment. Perhaps one of the problems with the model cities program was that it talked of almost this kind of approach--of decision-making and community teams--but it talked of these in a vacuum. These were in effect part of a program justified in and of itself rather than being directed toward specific problem and solution, particularly in the area of the physical environment.

And so, if we can look at the urban freeway or the highway as but part of the transportation system in the terms that I originally stated; if we see this system as the shaper of urban form; as the great catalyst that changes everything it touches, including our values and sub-systems; as that over which everything is transmitted--sewer, water, power, ideas, people, goods--by many different means and many different modes, including today the third dimension of the air routes; if we think of what this does to the physical fabric that exists or may be built, we have in the design of this system something that is highly controversial, highly imagable and something that can really get attention.

In the past these kinds of public design decisions have been made in a Renaissance way and it is this that has broken down today.

We have in this country perhaps placed too much reliance on the adversary theories that came out of the English common law--the idea that, by putting one person in contest with the other, the truth would emerge.

Well, this, I think, may work in the law, but it only works to the extent that controversy is rationalized by judge and jury.

To translate this theory into the functioning of our democracy no doubt makes sense, but again only to the extent that it is rationalized. We have grown up with the comfortable assumption that our political controversies are rationalized by the ballot box; that our economic controversies are rationalized by supply and demand in the marketplace.

Yet I'm afraid that these no longer exist as effective rationalizers.

I think what we see in our physical environment is not the product of a system anymore, adversary or otherwise, although it is no doubt the product of controversy. Our environment is merely a chaotic happenstance. If then our ballot box and market economics are not working too well, I think we urgently need somehow to restore these elemental rationalizers.

It is very clear, for example, that most public decisions today are not made by elected officials, but by appointed technicians. Therefore, the effect of the ballot box in putting into office or taking out of office the elected official has very little effect on what comes out of the public service pipeline, and increasingly what does come out of the public service pipeline has very little relation to the real needs and desires of the taxpayers.

The same thing is true in terms of private economics. The effect of building trades unions, and their cozy agreements with contractors, upon the cost of built space has nothing to do with supply and demand, except as both factors are artificially controlled by both parties.

And so if we can get these three teams working in a new ball game, on serious issues having to do with the form of our environment, these may become very real "lifeboats" and thereby act as swallows heralding the summer of our golden age.

These design/decision making processes, are, I think, very important. The difficulties are very great.

As to difficulties first, it is clear that diverse professionals coming together in a team create frictions. Who for example is to run the team? To reduce friction, the tendency is to divide the process up into neat professional packages and let each profession independently do what it has always done, which accomplishes very little. So you have then to recognize that the design team is a new and creative group of peers. You have to recognize the need to break down the language barriers between the team members--to perhaps invent a new kind of language--and go from there into the urgent business of corporately imagining the alternatives; of evaluating and presenting them together.

The more difficult problem though lies within the decision-making team and in my judgment it is the most serious problem of all. Its members are potentates who have very narrow areas of responsibility; who are undoubtedly expert in these areas; who may occasionally have been corrupted by their power.

They are not used to sharing their authority or to pooling their resources or to taking a back seat to another potentate. The problem is that they are used to the exercise of decision-making power. If I am head of the Department of Public Works, I decide where highways go. "Do not confuse me with the effect of my decision on parks, schools, and so forth. You have nothing to say about my highways. You do your parks and schools, and I will have nothing to say about these."

It is very hard to break down these barriers. But the way to break them down is by using the third team. And this is hard, too. The idea of designing an urban freeway, for example, in this new way, as part of an open, political process, may be mooted by the surfacing of controversy about goals rather than design. The real issue is perhaps whether there should be a freeway at all. Whereas, the design team is created to do a better job of designing the freeway, which of course assumes there will be a freeway.

But if the community can begin to participate in the decision making process affecting goals or design, the pressure that it generates (because it does hold real power) is such that the potentates have to respond. This is what I call "political design." It is not political in the terms of who gets what job in return for what campaign contribution. But it is political design in a very noble sense, for it addresses the sixty-four dollar question, the answer to which determines the possibility of at last achieving our golden age. The question: "Can a democracy, a successful democracy, build a beautiful environment?"

There is no evidence that democracy has done so in the past. Some may point to Greece and say "yes," but Greece may not really have been a democracy. So often the answer today, from sensitive and dedicated

people, is: "Certainly we can build a beautiful environment so long as we are freed from the constraints of democracy. Let us have, for example, an all-powerful development corporation, headed by a czar, and by God we will do it." They are right, for this has been the lesson of the past. Yet this answer begs the question.

If we are honestly to answer this question, we have to work within the frustrating frame of reference of democratic decision making.

Ideally what should happen is that the teams first understand and accept their roles. They must then begin to work together. (And to work together they must first solve one of the problems inherent in the community team. Who speaks for the community? The guy who says he does isn't always the guy who really does.) And then begins the trialogue between these three new institutions. This trialogue has to be open and this is hard. It is hard for the designer to come out of his corner and expose his tender thoughts prematurely to the public spotlight. Yet this he must do. It is hard for the decision maker to argue and debate issues in public which he has been used to deciding in camera and then handing down ex-cathedra. It is not so much hard as unexpected for the community to be asked to participate. The community is used to waiting until the last lines are drawn and bids are taken. The lid is then taken off and the community predictably says "no." Yet it must now participate from the beginning of the process.

So, it has to be an open process. And here you can use the media in very creative ways, if the media is willing to get off its negative "bad news" kick. It is not so much that "man bites dog" is news. It is "bad" news, at least for the dog. The media can begin to do positive things such as explaining the design alternatives.

I have seen this process work in several cities. It ascends a fairly conventional ladder of decisions starting with alternative basic objectives; then decisions among these alternatives; then design strategies to achieve the selected objective; then decisions among the strategies; finally alternative tactics for implementation (and only here do we begin to get into the finer details of the design).

We went through this process in Cincinnati, not with a highway, although it involved highways, but with its downtown plan.

We were the fourth candidate for crucifixion. Three consultants had been chewed up before we came in and in my judgment they had produced three damn good plans. But the City Council just tore them to pieces with the result that the City had no plan. It had a developer. It had the money, but it had no plan, and so we tried this process out.

We had a decision-making team set up. We constituted ourselves as the design team. The community, in fact, was all of Greater Cincinnati and so we had to work through the media. But all meetings were public and people began coming to them and they participated (although they didn't vote).

We were told two things when we started. One: "Do not propose an underground garage in your plan because this was the issue that killed the last three plans." Two: "Don't touch the beautiful old lady in Fountain Square." She is the Genius of the Waters and stood up like this in the median strip of a busy street. She was borne about 1870, I think. She was all green and she was pretty. But the water couldn't come out of her fingers because she would wet the cars sweeping by on both sides. But she was the sacred symbol for Cincinnati and you can't disturb a symbol.

We said, "Okay, you are the people who live here; you know what the situation is," and we started our process with these two "givens" accepted.

So, we went through the process and these two "givens" kept coming up for reexamination, not so much from us, but from others. At the end of 18 months we had a plan that was approved, embodied in some 260 City Council ordinances, ranging from basic objectives down to tactical details, such as street widths. We had an underground garage and we had the beautiful old lady--repositioned on top of the underground garage in the new Fountain Square.

It was not that the design team was insubordinate. We weren't. We were very subordinate. But the process began to lead to logical conclusions, and there is perhaps no one in Cincinnati who now remembers how the old lady was lodged before. She now has a beautiful new room and it is filled with people and birds and activity all the time. It really works.

Well, I believe the same thing can happen with much larger and more controversial issues, such as the design of urban freeway systems. There has to be a lot of leeway in defining our terms. Why freeways, for example, and not boulevards or something like them? What is wrong with 90-10 money just for improving a conventional street? I see nothing wrong at all, if we are talking about improving the total system. On Friday I have to talk to the Association of State Highway Officials and they have asked me to speak to this issue. It is an interesting coincidence.

But I think the procedural theory is the important thing, and I think this theory can be applied at almost any scale, for almost any problem.

We are perhaps more comfortable with physical design problems. Yet these have an interesting, non-physical spin-off.

I had the opportunity to view a tiny area, called Metro North, in East Harlem, and I have been watching its progress over the years. It lies between 100th Street and 106th and between Lexington Avenue and East River Drive. It doesn't really look that different from the rest of East Harlem, but about six years ago the Metro North community chose to fight City Hall on the issue of public housing.

They needed public housing and City Hall said: "Okay, here is what you get, 22-story buildings, zapp." "But we don't want 22-story buildings, we want 3-story buildings." "Well, you can't have 3-story buildings. If you don't take this, you don't get anything." The reaction is part of what Mayor Wagner was talking about. The community started to fight. They hired their own architect ant raised their own money and designed their own system of public housing. I'm sure their architect is not all that proud of the final design, but the client community was properly the real designer.

Metro North beat City Hall. It is not, however, getting three stories, but ten stories of public housing. The result is probably not all that much better. But the important thing is what happened to the community in the process, because, although it is probably not physically visible, this tiny area is now a true community. It has its own leaders who are responded to and listened to. It has its own programs which it is initiating.

I once made the mistake of commenting upon the problems of their "ghetto." I was told, "Sir, this isn't a ghetto. We don't have to live here. We choose to live here. Mister, you come back in five years and see what we have done."

I believe that this great ugly beast, our democratic society, does respect art. It may not know how to say it, but it respects it in simple ways. For example, by refraining from vandalizing that which it loves.

I believe, with Maratain, that the work of art is the offspring of a marriage between Time and Eternity.

I believe that this marriage is consummated within the mind of the artist, whether he is thought of as an individual or peer group, and that he is necessarily emptied at the point of consummation or there can be no artistic offspring.

This is a very different description of art and the artist from that portrayed by the self-sufficient orange architect of Ayn Rand, who goes around raping women and burning down buildings. Hers is the pure Renaissance description of the architect-artist.

If art is indeed the offspring of this wedding, I think you should and can see within it the characteristics of the two parents. The temporal parent has contributed four characteristics which describe art. I know most of us are hesitant to describe art, but I will try. These may not describe what is good art versus bad art, but I do think they may describe what is art versus non-art.

First, each work of art, to be art, has to be comprehensible, to be able to be grasped within the mind of the viewer, sensor or indweller. This does not mean that it has to be conventional at all, but comprehensible it must be.

Two, each work of art, to be art, must have integrity. This does not mean honesty. It does mean that you cannot lightly add to or subtract from the concept.

So, this is the kind of community-building spin-off that is possible from the design/decision-making process and it is very important.

Well, what is the end purpose of this process? I think the end purpose is art. Certainly if we speak seriously of our opportunity for a golden age (and I see no reason why we shouldn't speak seriously, for we can afford it and we haven't had it yet). We have to assume art, but art described in a non-Renaissance or a pre-Renaissance way.

I cannot look at the medieval cathedral without deducing that this was designed by a team. Where does the architecture stop and the sculpture start? What separates the stained glass from the music, from the refinements of structural engineering? And yet it is surely art produced by people who perhaps weren't conscious of being artists. Compare this with St. Paul's or St. Peter's Renaissance cathedrals, which are certainly also great works of art. In them everything is separated. The artists are named and known and this artist was labeled an architect and the other a sculptor and the last a painter.

We have grown up in the Renaissance tradition of viewing art as the product of an individual artist. We assume that he alone is capable of judging his art; that his art is consumed by an elite group who have satisfied presumably all other needs and can, therefore, afford to consume art.

I take a very different view of art. Please understand now this is a very personal statement. I believe that art is part of our daily bread, that there is a latent hunger for it within our society. Art is therefore not the prerogative of an individual to produce nor of an elite cultural group to consume.

Thirdly, each work of art to be art must have power, be it power to move you to hate it or to love it, but I don't think it can leave you unmoved.

And finally each work of art is individual, not unique, but individual; unlike precisely any other work, even from the hand of the same artist.

I describe these as temporal characteristics because I believe a psychiatrist might very well summarize Homo sapiens by this description. For each person at root must be comprehensible to others or we could not have a society. Each person at root must have integrity. Again I don't mean honesty. He might be a very big crook, but if he doesn't have integrity, he is in a booby hatch. Three, each person clearly has power. Sometimes in its use it is destructive, sometimes it is not. And fourth, each of us, of course, is individual. None is precisely like any who has been or is or will be.

The characteristic of the Eternal parent is only one. This is what Maratain calls Poetry, the mysterious language of art or eternity, that which flows sort of subliminally through the words of poetry, between the notes of music, within the spaces of architecture (including the architecture of our cities).

Now, if this is a true description of art and, therefore, a description of our end target, I think art must have a transcendental influence. It stands almost as a form of incarnation.

I don't know, of course, what its role really is, what its meaning really is, but if art is important, architecture is inherently the most important of all the arts, because a book you can open or close, an opera you can go to or not, your hi-fi you can turn on or off, but our environment you cannot.

This is with us forever, for better or for worse. Let us hope it is for the better. Thank you.

CHAIRMAN SHEPLEY: Thank you very much, Mr. Rogers. Is there anybody that has anything particularly on their mind that they would like to ask?

VOICE: You spoke much about art and much about the skeletal transportation system. I would like to ask you where is the art in the transportation systems that we currently have in the face of an interstate highway that is roughly about 80 per cent complete and also where is the effort to place art in the design of future elements in this transportation system?

MR. ROGERS: I can take the last part first. If we even suggested that the Interstate Freeway system, as it now exists, had any relationship to art, we would be hooted out of court. The creation of art was not part of the original charge. If it had been it would have offended both the officials and the engineer designers.

I don't think that is really so today. For example, in Washington (and it is funny, you know, the way we are moving as a country, in a series of jerks, but we are moving) they have today bought the idea of urban design. Most federal contracts which used to go to an architect/engineer now require that an urban designer be part of the team.

I think there is perhaps a somewhat oversimplified idea of what urban design is all about, but nevertheless, it is a beginning in the incorporation of art into these public work programs.

As to examples of beautiful interstate highways, I know of one. This is the Kennedy expressway between Baltimore and Wilmington.

VOICE: But it is all through open countryside.

MR. ROGERS: I didn't understand you had qualified your question.

VOICE: I'm referring to freeways in urban areas.

MR. ROGERS: Well, take Stockholm. Most of us think of the regional planning of Stockholm as being based on the rapid transit system. This is not so. They do have a fine rapid transit, but they also have a very fine freeway system, to interstate standards. They have built elegant freeways coming into the city and focusing in a tight circle at Hötorget at the very center of Old Stockholm. Near the City Hall the freeway is elevated as much as 50 feet and this was done precisely so they could develop recreational areas under it. It has been done very well and it is very handsome.

VOICE: To answer our problems here in this country, like the green giant that cuts through Boston, it means a completely new facility involving demolition and then reconstruction. Demolition is justified because what is there certainly does not add to the city and doesn't meet any needs of art. Then it comes down to the question, is it really relevant? Should it be there at all?

MR. ROGERS: Should the freeway be there?

VOICE: What we have here (in Boston?) is what we call the central artery and it does anything but move things.

MR. ROGERS: Well, I tend to look at what we have done as the outcome of a whole series of spasmodic and uncontrolled episodes which could hardly be expected to produce art or any kind of rational solution to any problem.

But I am not prone to look at these things that exist and "point the finger." I think we have done too much of that. Sure it's bad. Let's admit it, and see what we can do about it. But I can't say because what has been done so far is bad, that it can't be done well. This may, for example, very well require changing the Interstate Freeway specifications. You know, the Interstate System functions very well up to the point of connecting to beltways. Within the beltways it doesn't function very well. And you know why? Because it was never intended to go inside the beltways. The interstate program was warped politically because of that 90-10 money. How do we inside the city latch on to that marvelous pot of gold?

Let's be honest about it, we were not talking about interstate connectors inside our beltways. We were instead talking about 90-10 money and this was good politics in the past. All of a sudden it's very bad politics. And sure somebody is going to have to reexamine the program.

VOICE: That is what I meant. If the answer to the problem is not a highway, then the Federal Government should fund an alternative system in the same proportion, if the highway is not an answer.

MR. ROGERS: Yes, but you have to be very careful here because I cannot accept the "either or" argument. We see this now in many cities. "No, we don't want that freeway money. We would be corrupted by that. What we want is a rapid transit system." The answer is you want both. Right? Of course it is. Yes?

VOICE: Well there is so much damage already done, what is left to work with?

MR. ROGERS: Well, just one statistic. I don't know how accurate it is, but I believe it is estimated that within the next three decades this country will build in physical plant as much as it built from Plymouth Rock to the beginning of this decade.

What we have built so far is the matrix within which these horrible mistakes exist, right? Yet we are not just going to build a whole new America out in the fields (although sometimes it seems our Presidents like to think of this). I am not being critical. It seems so easy. It is much more exciting and American to build from scratch--to do a new town.

Yet an awful lot of this new building has necessarily to go on top of the investment that we have in our urban areas. That doesn't mean you are going to save all the buildings in the urban areas. Many of them shouldn't be saved. But you have got so much invested on and under the ground that you cannot logically walk away from it.

In Washington, the Whitehurst Expressway is a real monstrosity. All the planning up until about two years ago was based on extending it along the Georgetown Waterfront. Now they are talking about taking it down. Good. But they couldn't have thought that way five years ago. It would have been inconceivable. No, there is not going to be any taxpayers rebellion saying "you spent all our money and now you are tearing it down." Quite the contrary, because we are coming out of our youth as a frontier nation. As a frontier nation we assumed our objective to be maximum efficiency for minimum first cost. Now we are maturing and evolving a different set of values.

VOICE: I would like to ask you to talk a little more, if you will, about community as a form of art. The goals of highway building should be really to serve the interchange of people and the art that comes is as a result of the contact of people with each other. Therefore, one might look at the highway through the city not merely as often undesirable but, where it is necessary for movement purposes, as being something that might be treated as nothing more than an efficient utility--nothing much grander than a sewer carrying people. My point really being that a desirable highway in the city might be one that is totally suppressed, where the experience of the rider is far less important than the experience of those who are relating to its modal interchange.

For example, the Massachusetts Turnpike going through Boston is pretty much underground. It provides for payments from air-rights buildings over it. Its garage, next to the Prudential, fills in a big stretch. Now, ultimately this stretch might be completely filled and the platform thus created above could be, if connected properly, an interchange with other forms of transit and other movement patterns as determined by the greater community. The highway itself might be nothing but a tube underground.

MR. ROGERS: Well, you get here to the heart of my definition of art. As an architect I describe art (as I have) in terms of its physical end products, but there is a theology behind it which describes art also as non-physical. This theology suggests that each of us is called and few choose to be chosen--that few choose to be artists. And that artists are distinguished from one another only in terms of the raw material with which they work. The architect works with a different set of raw materials from that of the painter or the musician. But the person liv-

ing his life as an artist also has marvelous raw material and his art work is a life well lived.

VOICE: Well, I can't quarrel with that.

MR. ROGERS: No, obviously you can't. That is why I said it.

VOICE: That is a very evasive answer though.

MR. ROGERS: Well then it comes down to what I tried to describe as humane architecture, an architecture that does "connect" its community. Even very "good" architecture today is by this test really inhumane in my judgment.

VOICE: I agree with you.

MR. ROGERS: Does that mean, therefore, that the architect has to go back and throw everything he has done out and then propose, ex-cathedra, a better or more humane style? No. For he can't really tell what people want. Therefore, he has to put the decision-making responsibility into the hands of the using community, right?

VOICE: Yes.

MR. ROGERS: And this community has to have a shared set of values and mutually accepted processes whereby it can give these values expression in their physical art form. Right?

VOICE: Yes.

MR. ROGERS: But don't go so far as to assume that the using community is only the community that is resident and adjacent to major facilities, be they garages, expressways or whatnot. It also includes non-residents who use these facilities.

VOICE: Experience in the experiencing of the system?

MR. ROGERS: Correct, and so you have to strike a balance.

VOICE: True, but I think we have perhaps been exaggerating it the other way. We are too concerned with the user.

MR. ROGERS: I agree. I think, therefore, we must go back to the fundamentals. This is really taking my Metro North illustration one step further.

What is the first thing that is necessary if we are to begin to give birth to a great new cultural age?

The first thing that is necessary is that we begin becoming a community, nationally and locally, and for that to happen we must begin to communicate with one another in our physical environment and in many other ways.

While we must recognize that we are quite a social kaleidoscope as a nation (and I think that our variety is an asset), we must also recognize that each of its bits and pieces do have to begin to work together. So you can't just isolate one group, one resident constituency, and say that everything is subordinated to it. Therefore, this highway is underground. For there is another constituency that will be using it and our mobility is such that people move from one constituency to the other very quickly. It is a question of balancing the equities.

VOICE: I agree with you. I would like to ask you, in your Baltimore experience, what are some of the positive benefits for the community that you have seen from the highway? In the use of air rights, for example, what opportunities have been generated for the city?

MR. ROGERS: Well, for example, a very good case was made for routing the freeway through a park that serves one adjacent constituency. The alignment has been so designed. This route has a lot of political commitment behind it, but there is still a lot of political uproar. Anyway the design proposes to take through the park a two-mile stretch of this 24-mile system which would otherwise have to go through existing communities. In the process, the design calls for expanding the park and creating a much more usable park facility, using highway trust money for planning and development. Now, this is intelligent design, even though it runs against a certain bias which says so often: "Touch not a green hair of this head."

The Franklin-Mulberry corridor, in the inner city, was destroyed long before the design team came aboard. It was destroyed ten years ago when somebody drew a line on the map. Today there is really very little to save within it, but there are communities on either side which are mostly black and impoverished. Here is an opportunity, by depressing the highway, for putting in air rights developments to provide many amenities, commercial facilities and community facilities that never existed there. It is not, however a tunnel.

VOICE: A tunnel would be the extreme position.

MR. ROGERS: It is designed as a series of air-rights platforms, but why should a tunnel be visually bad? All you have to do is walk through underground Montreal and see that its tunnels are beautiful.

VOICE: I agree.

MR. ROGERS: For that matter, why should a garage be just a place to dump a car? Why shouldn't it be the gateway to a pedestrian system and therefore designed for the human being rather than the car?

VOICE: Really, I am not arguing with you at all. All I am doing is jabbing a little bit at the tradition of the engineering attitude toward highway building which has been to put in the highway in isolation and then try to make it more beautiful per se.

MR. ROGERS: And this leads to abortions. Take the uproar in New Orleans concerning the Jackson Square Freeway. First of all the engineers said it has to be this way, just an ordinary elevated expressway, since anything else would be too expensive. They finally realized that they were in a sort of tough fight. They then said: "Okay, we will take care of the problem by putting iron grill work all over it."

VOICE: Fake stone?

MR. ROGERS: Yes. They were going to spend another 500,000 bucks to apply grill work.

Yet I don't really fault the engineers. Their current image and tradition is fairly new. Most of our great city planning, certainly before the revolution, was done by military engineers, many of them out of the French Army. L'Enfant was a military engineer and so was Fauquiniere, who laid out Savannah. The engineers had quite a body of artistic experience to draw on. But they go corrupted partly, I think, because of the importance assigned by a frontier society to the nuts-and-bolts phase of engineering.

VOICE: One minor defense of the engineer. You did touch on the issue of community. When we look at the Greek cities, where there was a clear sense of national identity and purpose, this generated the drive back to the czar who had the power. For him the engineers delivered the products that we all like so much. So, I think that, when there is a sense of community that generates a clear purpose, then the engineer simply serves that purpose. If there is instead ambiguity, and the faith in economic determinism that we have known for the last 100 years, then the engineer generates a different product.

But the question I was going to ask, which I think really touches an area about which we all tend to be a little dishonest, involves your third team, the community, and its ability to really articulate its goals. It also involves our ability as designers to respond to what we think the community wants. In many instances maybe our experience limits the alternatives that we present. You know, the common complaint in the black ghetto: "You middle class, white designers come in and tell us what we want." How do we really solve this? How do we understand? Or maybe there is something more we all have to learn in order to help this third team.

MR. ROGERS: Well, there are some specific techniques.

One, for example, is simply bringing into the design team this new professional, the sociologist. For example, Stanley Plog, who is a behavioral scientist in Los Angeles, has had productive experiences in getting at the true attitudes and values of communities as compared with their expressed attitudes.

You go into a black community in Baltimore and ask: "Gentlemen, what do you want? We will give you anything you want for we have behind us the whole highway trust fund." "Well, we want what the man has." "What do you mean by that?" "We want that little white house on that little old green lawn." But when you begin to dig into it, you find this is not what they want. Yet they say it for certain reasons, such as the desire to have the symbols of middle class affluence, even when these symbols don't fit their life style. So, you have to get behind what is said and it is hard to bridge this gap. It is hard to build any kind of confidence on which real communication can be built as a means of getting behind such statements.

Perhaps a more honest way to handle it is to truly create a malleable flesh. This becomes very difficult when you are designing the transportation skeleton, but in the design of the flesh around it, it should not be difficult. This means schools that could later become housing or industrial; that dwelling units should have mobile partitions with snap on decor. (Why should the architect impose his own color scheme on the occupants?) You thus design an environment, to high standards of comfort, where uses can phase out and other uses can phase in; where different life styles can be self-expressed. The occupant doesn't have to go to an architect and say: "Here is my life style, I want you to express it." He does it himself and becomes self-fulfilling in the process.

VOICE: That tends to solve another problem, which is the mobility of the changing community. You work five or ten years to develop a plan only to find the community gone.

MR. ROGERS: Sure; exactly. I say, partly because of the high mobility of our society today (which is a desirable feature); partly because of the pace of technological, social, economic change we are experiencing today; you cannot honestly look more than two or three years ahead and say what the problem is going to be and, therefore, what its solutions might be. Right?

How then can we plan for ten years ahead?

Now, this wasn't so not long ago. Certainly in the last century you could look 30 or 40 years ahead and be reasonably close to the mark.

So, I think, to be honest, we must simply say that we don't know and that, therefore, we should invest our money to create an adaptable environment which will respond, or can be made to respond, to the unforeseeable. It is really non-architecture that I am talking about, and it is very expensive, in terms of first cost, to create truly flexible spaces. Yet we know it is wrong to go through the time-consuming preparation of a meticulous program and then freeze this program in our architecture at one moment in time. Yet that is the way we architects have been brought up.

VOICE: I would like to ask you a little about your Cincinnati experience. You implied that a glowering, snarling City Council, which had devoured three previous consultants, suddenly became quiescent in the face of your sweet reason. What I would like to ask you is how did you really get the design commission?

MR. ROGERS: Okay. First of all I would like to describe this glowering City Council. It's probably one of the most sophisticated and enlightened groups of politicians in the country. At the time I worked there, there were three factions: One, the Charter faction, which was in theory non-partisan and which was led by Charles Taft, Senator Robert Taft's brother; two, the Democratic faction, led by John Gilligan, who is now Governor of Ohio; three, the Republicans led by two men of equivalent stature. These were very partisan groups in the City Council, but they were not much motivated by conventional, parochial politics.

Secondly, how did we get the job? Somebody had apparently heard of the work we were doing in Hartford, where we were exploring this kind of decision-making process, and suggested that we be talked to on the basis of not simply repeating the design of a plan, but rather on the basis of designing a planning process.

We were, as I recollect it, called into an interview after the selection committee had reportedly chosen another firm. We were then a very small firm, and I personally was deeply involved in downtown planning for Hartford, Albany and Greensboro, North Carolina, all at the same time. I couldn't see how Cincinnati could possibly be fitted in. And so I'm afraid I gave wrong answers to every question.

"Mr. Rogers, would you guarantee that your plan would increase the tax base of Cincinnati?" I said: "No sir." "Would you guarantee that this plan would be completed within one year?" I said: "No sir." "Would you set up an office in Cincinnati if we commission you?" I said: "No sir."

There is, of course, more to it than that. I did make some suggestions "for the good of the order" and did therefore outline our theory of design and decision making. But I left feeling sure of the committee's decision. Anyway I was at the airport to catch a plane back to Baltimore when I was paged. I got on the phone and was told: "You have just been selected." That is how we got the job.

VOICE: I feel strangely unsatisfied.

MR. ROGERS: Nevertheless, that is the true story, so far as I know.

So we accepted the commission. Our real client was a working reviewing committee, on which were the leaders of the three Council factions, as well as the city manager and the heads of the key city agencies plus leaders from the private community--about 21 people, each of whom did meet the essential requirement of being a potentate. The committee was chaired by Mark Upson, a retired private executive and member of the City Plan Board.

The city was under the gun. It had the money. Its program was approved by Washington. It even had selected a developer and the land was ready to be sold. But they didn't have a plan. So the committee was understandably impatient to see our initial designs.

I said: "Whoa, we can't start drawing yet. First you, the committee, have to make a decision as to the basic strategic objectives of the plan. Do you want an auto-oriented downtown, for example? If so, do you want to carry the freeways through or around your downtown?" These kinds of general alternatives, as important as they are, could just "turn off" such an action-oriented committee. But we finally began to get the process across. They made their decision, pretty much accepting our recommended alternatives, and we then wrote it in legal language. There were some 30 alternatives considered, of which they selected ten as a consistent family.

We were again asked to start our design work. Again we said:

"No, you have to put this now before the City Council for action because you are just recommending. Your recommendation has to be passed formally to the city planning commission which then has to formally approve and pass it on to the City Council." "But how long will that take?" The councilmen sitting on the Review Committee said: "We can act on it in a week." And they did just that!

Their action created the first of some 260 City Council ordinances. Then we started our design at the level of strategic concepts, expressed diagramatically. The committee began to get more and more interested. The public was by now beginning to come in and be heard. We had the whole plan wrapped up in 18 months.

I think we were hired not because we were the best designers, although I think our design is quite good, certainly no worse than in the previous plans. We were hired instead because we were willing to design within a real world, political decision-making process.

Most planning, you know, is like asking an architect to design a house. He says: "Okay, fine. Now how many bedrooms?" "Oh, we don't know yet. Just design the house and when we get the bids in, then we will tell you how many bedrooms."

VOICE: I happen to agree with you that the decision making has to be done at a political level, otherwise it won't take place. But I am just amazed at the good luck you had in Cincinnati.

MR. ROGERS: There was a lot of luck.

VOICE: Yes, because the good technique that you have won't work everywhere. Most City Councils are probably not as enlightened as the one you had to work with. And what you are more likely to find in community participation are the people who have not really been represented in the process, as you have pointed out. These are now being represented by perhaps advocacy types of planning. They no doubt need this kind of representation, but all of this develops into an adversary situation.

MR. ROGERS: That is right.

VOICE: Which is many times the only way that the problem can be solved. While it is abrasive and perhaps frustrating, the politicians are persuaded because they begin to worry about the opinion of their constituency rather than because of any sudden enlightenment which descends upon them as a result of a good consultant like yourself.

MR. ROGERS: Don't misunderstand me. In the Cincinnati process, while there was a lot of luck, we knew that we had to have the constituency sold before we could possibly get the ordinances through City Council, enlightened or not. It was very clear, at the last of the decision-making meetings, concerning the Fountain Square statue, where the historic clubs, garden clubs, etc., all came in and had their say and all wound up supporting the move, that the political problem had really been solved. What I am saying is not intended to overplay the Cincinnati experiment, but it does give hope for converting this abrasive and wasteful adversary process into a positive and more organized step-by-step process.

VOICE: Now, thinking of the anti-pollution push right at the moment, certainly the leadership did not obtain its support from the political system. It obtained this from people concerned about it and then the politicians recognized it and climbed on the bandwagon.

MR. ROGERS: I think you have to qualify your point. I'm not sure that any such political push originates with the people in a general sense at all. I think it instead comes from a very small elite who has identified it as a real problem and then creates its public constituency.

VOICE: Yes, but these are not politicians. They are outside the political arena, so to speak.

MR. ROGERS: That is right, but neither do they have the conventional politicians' constituency.

VOICE: You talked about incredible changes--rapid urbanization, sub-urbanization and a new nation with new ideas and a new art. Yet it seems a little ludicrous to be talking about the same, single family mode of transportation. If we are to go through these very rapid, attitudinal and behavioral changes, it may be a little immoral to continue to design highways. Mine is a very naive, very basic first year design school question, but I wonder if, your having by now a considerable amount of power, you ever lie awake at night and worry about the immorality of telling people they should be designing highways when perhaps you have the power to convince them in a lot of cases they should be designing other systems?

MR. ROGERS: Here you get back to the fundamental premises and I think it is important to examine them. The premise on which I told people in Baltimore they ought to be designing better highways was not the premise in your question. The City Council had just completed action on its condemnation ordinances and, therefore, by the evidence of this action, all the political and legal problems had been solved and the

highway was going to be built. That was the basic premise.

Therefore, my premise was how can you do a better job of designing it more sensitively and sympathetically. The design team was hired to do this better design job--and I recommended it, but was not on it because I felt it could create a conflict of interest. So Nat Owings filled the role. Anyway, the first thing that the design team was told was: "We have been ten years solving this political problem and finally got all the ordinances passed. Don't touch anything outside the system that is given to you in your contract." The design team had to accept this and yet it soon became clear this was a purely political decision and that the system didn't work, even from the point of view of function. It proposed, for example, an inner harbor bridge of 14 lanes which would still be overloaded the day it opened.

Well, it didn't make sense and so the design team came back after about two months of agonizing and said: "The system is wrong." They were told: "You can't change it, I'm sorry." "Well, you can't stop us from thinking." "So, all right, think, but don't bill us for any time rethinking the system." And so they went back and voluntarily designed a different system.

Now, two years later that is the system that is to be built in Baltimore and it is a far better system and is much less disruptive. It was simply the result of opening up the process. You know, enlightenment really is what happened here, without the individual actors being necessarily all that enlightened per se. But there were real gutsy decisions made, for example, by our Mayor when he bought the system. So that it was a procedural experiment that forced acts of great political courage. It assumed a freeway, yes, but the whole system has been dramatically changed.

Now, as to the more generic moral question. I have said that I don't think we can predict, and this you know is not a statement involving morality. Nor do I think there is anything immoral in the love affair between the American and his car. It is just being carried to excess on occasion. But I do think we have to try to be generous in our designing and in our dimensioning of corridors so that they can accept unforeseeable change, particularly I think in this case of technological change. Many such changes are soon to be upon us, yet we cannot predict which of these changes is really going to make it. This will be determined partly by economics, partly by attitudes, partly by the whole new political ball game. Certainly atmospheric pollution will have a lot to do with the outcome.

VOICE: I recently read an article explaining the dangers of the kind of thing that you have been involved in within the system --

MR. ROGERS: Do you want to see my scars?

VOICE: -- the danger of the designer being used, being manipulated by a political body to sell an idea and I think that you probably should comment on this.

MR. ROGERS: Well, that was the fundamental suspicion that plagued the Baltimore design team.

First of all, there was the continuing argument about whether there should or shouldn't be a freeway per se. If there should not be a freeway, then the design team made no sense. It wasn't even a question of which system was best, but was a very oversimplified opposition based on, "No highways period." And I think this is irrational.

The second thing was the suspicion (and I am not sure that this wasn't true) that the design team was being accepted by the politicians and the administrators, even up to the Bureau of Roads in Washington, as simply a new tactic to see if they couldn't get this freeway started, because it had been stalled all this time. I guess it is a little cynical to say: "Okay, that is why it was accepted, but so what?" It did a job once it got there and a lot of people have changed their attitudes in the process. For example, when Secretary Boyd committed what turned out to be $8 million for urban design of the freeway corridor, this was, I think, the first break in the very narrow view restricting how the Highway Trust Fund could be used. We expected all sorts of uproar over that, but there was no uproar perhaps because of this rather cynical assumption that there wasn't going to be any concrete poured unless a new tack was taken.

VOICE: Would you, if you were asked by the proper people, design the inner belt to finish the link through Cambridge?

MR. ROGERS: If I were convinced that the inner belt were going to happen, in any case, I certainly would design it, yes.

VOICE: That is immoral.

MR. ROGERS: Yet it is perhaps an honest as well as immoral answer. I would look to this as an opportunity to do something to improve the inner belt.

CHAIRMAN SHEPLEY: There may be one or two questions which haven't been asked yet, and I'm not sure about it, but I suggest that we adjourn to the lounge for coffee at which time I am sure that our speaker will be available if he has any energy left to tangle with them.

RESPONSIVENESS IN THE DESIGN OF TRANSPORTATION AND ENVIRONMENT

DAVID CRANE

MR. DOBER: I'd like to welcome you and David Crane to the BAC tonight for the fourth of our lectures in transportation design. Tonight's lecture is entitled "Responsiveness in the Design of Transportation and environment." Our speaker, as you all know, is David Crane, Architect, a person involved in urban problems, and in innovation at many levels.

It is a particular pleasure to welcome David back again to Boston, where, from 1961 to 1965, he served as Director of Land Planning and Design at the BRA, and was responsible for the design excitement and much of the environmental improvements that that particular agency started and is carrying on.

David's educational background is rather comprehensive and complete. He attended Davidson College, received his Bachelor of Science in Architecture from the Georgia Institute of Technology, and a Master of City Planning from Harvard. He has 20 years of work experience. The kinds of places he has been and the kinds of things he has done, are best described by saying the word "outstanding."

There are few people that can be turned to, I think, for very strong opinions about anything in this day and age. David brings with him a sense of purpose, a sense of skill, and a sense of what the future might be like. Those are rare qualities which he has the ability to express very fully.

MR. CRANE: Thank you, Dick. It is great to be back in my favorite town. The happiest years of my life were those ten years that I did live and work professionally here.

The Boston Architectural Center has had humble beginnings, but it commands a great deal of respect. Quite frankly, the invitation to lecture to you tonight on transportation design is one of the first times in the last several years that I have been turned on about public lecturing. It gives me the opportunity to reassess some directions. Perhaps, for a few years, I have been less interested in lecturing and a great deal more interested in doing. And sometimes, when one does that without standing back and looking at what he is doing, he can lose his sense of direction. So I have taken this invitation as an opportunity to catch up with what I have been doing and to see how it compares with the kind of theories of design that I have advocated in the past.

The social conflicts which the design of transportation today involve are fantastic. They are almost like the issues of peace and war. We have fantastic dichotomies between transportation as a good, on one hand, and housing and neighborhoods, values on the other hand. We have one group saying "We need transportation." We have another group saying, "Housing and people come first." We have the environmentalists and ecologists shouting for environmental conservation, on one side, and the transportation development agencies pushing for "progress" on the other side.

Ours is a society on wheels, and there is absolutely no ducking the need to eliminate these kinds of fruitless dichotomies. There is no reason the poorest people in our cities should not benefit from whatever advantages of transportation technology and design we can bring to bear in the modern city. There is absolutely no reason in the world why we have to make a choice between the ecology and the ability to move. The ability to move is fundamental to social and cultural interaction on the broader levels, and this sense of communication is what civilized cities truly must represent. If we cannot find a way to eliminate these dichotomies, then we are in very serious trouble.

How does the architect and urban designer approach these kinds of issues? In the past, and for many years, I have followed a philosophy known to my classes in urban design as the "discipline of movement." I have said the first and most important source point for an urban design rationale is movement systems of the city and everything they connote with respect to where and how we ought to build space.

Note the words "the discipline of movement." It is rather traditional, in functionalist art and design circles, to look for some kind of simplifying rationale. One of the most popular in contemporary architecture has been the circulation concept as well as the crutches of structural systems. As I have tried to take the ways of thinking of the architect into design of larger-scale environments, I have, I suppose, simply transferred this search for simplifying structural circulation discipline to the larger and less material environment.

However, the experience of our office in actual transportation problems over the past five years suggests a revision in this philosophy. It suggests a revision from the way of thinking that says "discipline of movement" to a way of thinking that says "liberation of movement." Liberation of the infrastructure of the city.

The need is for a new level of design responsiveness to social and environmental criteria. The urban infrastructure of movement systems has, for too long, been regarded as a kind of technically-determined public space beyond private resources, impervious to social and aesthetic concerns. Our need now is for innovative spatial forms, new design processes, and new producing and operating institutions for pedestrian, public transportation, and automobile systems, enabling urban design qualities that would be responsive to the design of what I have referred to as the liberated urban infrastructure.

In this presentation tonight, I want to dwell on different kinds of opportunities for the integrated design treatment of movement systems and built space. My aim is to call attention not necessarily to final answers or solutions, but to the need for designs that are responsive to social and environmental concerns.

Now, may we have the lights out? In my presentation, I will first dwell on some of the areas of conflict between present approaches and the problem, and then I will speak in general terms about the kinds of directions in which a socially and environmentally rewarding theory of design might go. Then I would like to develop some of those ideas in terms of the project experience that we have actually had.

In terms of the kinds of conflicts that we have, the ten-lane Dan Ryan Expressway in Chicago (on the left) and the interchange that you see (on the right) are both indicative of the kind of conflict caused when design standards born on the prairies are brought into urban contexts that are totally alien to these kinds of standards.

This is the before-and-after of the Oak Street connector in New Haven. It is this kind of before-and-after situation which has caused the dichotomy between neighborhood values and major transportation facilities.

It is this kind of conflict and dichotomy that has led to the sort of thinking depicted in the cartoon: that we are on the road to palaces through hovels that travellers don't care about and that the travellers' goal has absolutely nothing to do with the true problem.

Now what have designers added to this? Designers have been largely motivated by concerns of finding orderly simplicities. They have been concerned with technology. They have been concerned, frankly, with out-rationalizing the engineer in his search for efficiency concepts.

On the left is the plan for Brasilia, a city of 500,000 people, whose circulation structure is characterized more by its simplicity than by its responsiveness to a variety of transportation needs.

This is in the basic tradition of the contemporary architects. Simplicity for simplicity's sake.

I do not have unreserved admiration for the recent advisor to the President, Mr. Moynihan, but he did say one thing that was quite good as he left office a few months ago, i.e. this country needs more "complexifiers." Brasilia and Tange's plan for Tokyo (left and right) are examples of technocratic searches for circulation rationale. They are searches for simplifying concepts rather than concepts that relate to the reality of who needs to move, where, for what purpose, and at what speeds.

We have been long inclined to look at the chaos of private transportation around us, looking backward 50 and 70 years, and then to say that we had a greater public transportation technology then than we have today. We then leap to the conclusion that what is needed is more rapid transit systems of a rather traditional sort (on left) or that we need roads-determined design concepts such as the well-known British scheme of Motopia (on the right), in which the entire housing fabric of the city becomes served not by movement systems but becomes the by-product of movement systems. This is a kind of technocratic approach which the designer and the engineer have tended to take to contemporary movement problems, which I suggest is out of keeping with the kind of social and moral pressure which is causing the present conflicts.

Now what are some of the directions that we might take in developine a more rewarding theory of transportation design? First of all, I think we have to attack transportation problems at much broader strategic levels. In this project (on the left) is a proposed transportation systems plan for a vast area of Santa Clara Valley south of San Francisco, and (on the right) the staged development of a road system through the lower part of the Valley, which is now largely agricultural. In the first stage, the idea is to have a fairly modest road system serving recreational resources up in the mountains and to keep major highway development out of the agricultural areas of the valley until it is proven that this kind of transportation is needed. It is very clear that if major interstate highway system standards are applied in the lower, flatter part of this valley that the rural land will no longer serve agricultural purposes.

But this notion of a staged approach, a much larger regional approach, is simply an example of a larger idea that I think we should follow, and that is that we have to look at not only the appropriate geographical scale at which to solve a transportation problem in order to avoid impacting sepcific neighborhoods or environments, but that we also have to put the determination of the need for a facility before the design of that facility.

Too often, transportation design has been based upon fitting a preconceived concept through a particular area or corridor without really stopping to ask whether there are travel demands and cost/benefit ratios that justify that particular approach.

A second key point for a new direction of theory would be the idea of diversifying the design vocabulary with which we approach movement systems: design and diversification of basic standards of movement systems.

On the left is a survey of the existing street widths in a particular area of Philadelphia. On the right is an analysis of a variety of uses that can be made of various kinds of both existing and new street sections. A key point in the development of a more diversified responsive design vocabulary is the ability to fit our design functions and standards to the space that we have in which to satisfy them, to make them fit into a local environment rather than to come to that environment with a preconceived scale and quality of motion which will have negative impact.

As part of this diversification of the design vocabulary, we must also take new approaches to a rather traditional criterion of transportation design; namely, the notion of classification of movement systems, classification of functions, specialization of functions, separation of functions, and integration of functions at both a horizontal and vertical level.

We have to begin to recognize that the same function may take different forms in different environments; that sometimes a single path, as shown on the left, will do, and sometimes we need families of paths of specialized functions of paths, specialize them, then we have the chance of taming them down to relate to the kinds of environments through which they must pass and for which they must provide service. Instead of our cherished doctrines for separation of pedestrian, vehicular, and public transportation systems, we must begin to think as much about the integration of these as their separation. And, there are many ways in which to produce the separations and the integrations, as indicated in the diagram on the right. The fabric of transportation has to become much more flexible and responsive, and this will, in turn, have a big influence on basic standards of transportation.

One of the things that the architect can begin to contribute to movement systems, in lieu of the kind of cosmetic work that he is usually given, is to contribute a basic inventiveness of facility, rather than simply taking known types of facilities and putting them in a little better clothing. I would suggest to you that there is no facility more needed today than what I call the "junior expressway." The "junior expressway" is hypothesized as follows: a free-flow, totally uninterrupted, movement through a congested urban area, no more than four lanes in width, below. The local movement grade provides access to existing streets at least as frequent as 800 feet, causes no traffic congestion in its vicinity, yet does all these things while accommodating widely varied types of trips that occur to and through congested urban areas. Of course, this is a statement of dichotomous criteria! There is no facility more needed to be invented, and yet so far from our present realization.

A third key point in the development of new theory is the notion that we need comprehensive design criteria for circulation space. We do not gain anything if we continue to follow the single-minded traffic engineering criteria for the design of streets. A street has many roles. Well, let us say a circulation space has many roles and each of them evoke criteria and determinants which are a source of form. I speak of these in terms of "the five faces of movement."

The first "face of movement" is the face that traffic engineers have respected. We might call it the "carrier role" of movement. The "carrier role" has to do with mode, speed, volume; it has

to do with distances, origins, destinations. Never mind what modes; the canals of Venice represent one kind of extreme, and perhaps, the carrier role has to do with the quality of motion. Is it "stop and go"? Or is it "go," using the terms of Louis Kahn, who drew the drawing on the right for Midtown Philadelphia?

The street has a role as a "space shelter" for human activity. It is a defined space in which certain services are performed. Here, on the left, is a street in Pakistan serving as a barber shop. Piazza San Ignazio in Rome (on the right) was designed by Baroque Architects, who were so imbued with the spirit that the street is a public living room that they designed this particular piazza, simply a widening in the street in the then-classical form of the theater. Thus, the design of the street is for a place of human drama.

The "space shelter" role of the street was well recognized in the design of Pompeii, where a street sloped in certain directions to permit, one day a week, flooding the street as a sanitation measure. When the street was flooded, it was important to have raised stones for crossing, and the stones had to be just so far apart that the wheels of wagons could pass between them. It was a street that was designed to serve many functions, some of purely technical nature, and some having to do with human activity in the street. A street plays roles beyond the sheltering of vehicles. It must invite many other activities as well, depending upon what level of circulation we are speaking about.

Many of us in architecture have tended to think that streets needed to be defined architecturally, with certain "walls" or architectural formalisms, but the traditional American street, exemplified by this one in Nantucket, is one in which the trees hide the individualities of the various works of architecture. It is a street in which there is a sense of the difference between the collective purposes of the street and the individual values served by it.

A third role of movement space is that of the "city-builder/city-destroyer". It is a well-known relationship that streets create land values and intensities by use, as exemplified in this drawing on the left; that streets of major traffic function create high values, breed commercial uses and high density, These tendencies are felt on both sides of a street. Sometimes, the traffic characteristics of a street can get out of kilter with the use-and-land-values potentials of the street, in which case a symmetrical relationship of values and uses from side to side is not found, or development is uneven along the length. We don't have a rhythmic architectural quality in these circumstances but we can recognize the generative or destructive potential of the movement in the street. This street in Caracas (on the right) shows one of the instances in which traffic growth temporarily produces a lack of relationship between the built environment and the street. So the street has the power to build and the power to destroy. This is a basic point of departure for any notion of architectural rhythm and scale in urban design.

A fourth role of the street is as a "channel of intelligence." The classical streets, as in Paris, were designed with formal vistas at their extremities with very formal visual relationships intended to give some message. Contrasted to this concept (on the right) is a study by some urban design students recognizing that, today, with the automobile, we can no longer focus on fixed images of a highly selective nature; rather our visual experience is much more dynamic. We require much bolder devices and targets for the searching eye.

Not only is the movement system a thing from which to seek and gain some invormation about the city, but the movement system itself, has become so complex that it requires some visual explanation of its own internal purposes. Louis Kahn called attention to this in his plan for midtown Philadelphia in which he suggested that different streets, and their relationship to parking garages, would be signified visually so you could tell the red roads and the red parking garages from the yellow roads and the yellow parking garages.

Corbusier's "Seven V's" concept was a system of classified circulation design functions; if he had been more responsive to visual criteria. Corbusier's red, blue, and purple roads would not only be so on paper but would be pigmented in the built reality as well.

Finally, movement systems serve as "connectors." They serve as means of communication, as means of one neighborhood talking to another neighborhood, one group entering into a social interaction with another. The Ponte Vecchio across the River Arno, in Florence is perhaps an example of the "connector" or of the movement system linking socially one bank and the other of the river.

These drawings suggest some of the preoccupations that we would have in relation to the connector role of movement; namely, that movement systems have definite directions. They have definite ending points. They produce relationships of a specific nature between one place, one function, one group, and others. On the left is a study of a multi-directional movement system of different scales for the new city of Peruvia, a student project for eastern Peru. On the right is a study of a topology connections perhaps appropriate to a transportation system in southern California. In both cases, we are looking at, or wrestling around with, the fact that people want to move in many directions, infinite directions, in fact, and it is only the danger of the automobile set loose without constraints that causes us to put it in limited directions of the gridiron system. We must look for richer, more versatile geometries with which to connect one area and another, one group and another. So much for the "five faces of movement."

Beyond multi-purpose versus single-purpose design, a fourth key area for innovation in our theory is the idea that we must use circulation improvement to dissolve constraints on social interaction. We have got to make new connections. We have got to start optimizing the positive benefits of circulation to the specific urban neighborhoods, rather than spending all our time trying to minimize the negative impacts. This relates not only to circulation benefits for local users who are often not benefited by major expressways that cross their territories (and who could better use local street improvements), but also the use of transportation development programs to support and encourage housing, schools, local facility needs of one kind or another, through joint development in connection with transportation improvement.

We need schemes, not barriers.

Here is a student scheme for taking advantage of unused and unneeded street space in the Bedford-Stuyvesent area of Brooklyn to produce long, linear multi-use environments with housing for a number of more transient types of people that are found in this kind of an area. Here there is a reduction of the traffic role of those streets and space is pulled together from the unneeded circulation space and deteriorated traffic frontages to develop dense housing of types which is perhaps unwanted in any particular local block but which is truly needed in a balanced community meeting varied user needs. From these kinds of strategies of circulation and housing, problems of relocation begins to be solved in space created from the streets.

Here is another student exercise in the development of an expressway system

through a Philadelphia area. A family of small, single-direction movements, created to fit into existing street space, is made to define a zone for community development and change. In the process, a series of opportunities for joint development of schools, housing, and other community facilities needed by neighborhoods on the other side of the development are established.

On the right is a study of the key intersection between this community-oriented system and the great Broad Street axis of Philadelphia. Here is suggested a multi-mode integration of movement systems and integrated treatment of the space for movement with the built environment: a major cultural center, parking terminal, and so on.

This and the additional example of intersection design shown here underscore a fifth key point in our search for a new theory; i.e., that we have to reduce or eliminate the dichotomies and architectural separations between systems. We must de-institutionalize the architectural forms of built space and space for movement. We have to link the expressway system to the street system, to the subway system, to parking, if these systems are to interact functionally as they are intended to. Public right-of-way and useful private domain must merge and infuse each other, and perhaps the sponsorship and financing of these precincts will also change as required by desing innovation.

On the left is a student exercise in redesigning Place Bonaventure in Montreal. Many of you have been to Montreal and know Place Bonaventure as a big, hulking mass of real estate which is at once a hotel, a retail center, a convention center, an office building, and a parking garage. But one could never tell all of these different functions from the way in which this elephantine mass has been put together. But here, in the student design, we begin to give recognition to the pluralistic purposes of such a building in which we see the building as a "wrapped-up street", as a building which is a piece of circulation architecture with its own internal public environment, perhaps privately paid for, but institutionalized for public benefits. Here is the recognition of the architectural transition between the space for movement and the space for stopping.

On the right is a piece of work by a former student and dear friend, the architect Roelof Uutenbogaardt. He has been particularly interested in exploring the possibilities of bringing the sense of the street into a building. This building is a mixed-use building for retail office use, with some parking, and it is organized on the idea of pedestrian and vehicular entrances at several different levels of the streets that abut the property, taking advantage of these to create more than one ground floor through the dynamic sense in which the street moves through the structure.

He was able, through this kind of a plastic design, to enable his client to sell the upper levels for the same rent per square foot that one would normally get out of a ground floor retail use, s simply by the devices that have been used here to expand the sense of the street moving into the building.

So from this last point, i.e., the de-institutionalization of and elimination of differences between movement systems and between the street and the building, I would like to move now to a discussion of the project experience in our office which has been guided by some of these ideas.

The first series of projects have to do with transportation as social and cultural interactions and as a basis for institutional change. Three of them have to do with the role of schools in cities. Bussing of school children has been much on all our minds for the last years. Many of these projects have been very closely involved with those questions of racial and social integration in the educational system. At the same time, these questions have involved the other side of the coin: racial and social solidarity. Our work and theories in circulation systems design has very much influenced our contributions to these problems in educational facilities innovation.

The first project is a project for the Corde Corporation and the School District of Philadelphia. This study came about when the National Association for Advancement of Colored People proposed the abandonment of all of the Philadelphia schools and the creation of a series of educational parks of a hundred acres and 20,000 pupils each to replace the entire school system of Philadelphia.

We were asked to analyze whether or not such a system would be possible, and if not, what were some of the alternative concepts that could begin to give some answers? We proved that geographically it is impossible to produce that kind of integration in Philadelphia because you cannot find sites of such size, and the geography of Philadelphia is such that the travel distances would be unreasonable. But we came up with a varied kitbag of educational complex prototypes which might be tried under different circumstances for different purposes. On the left is an educational park for suburban circumstances, on a site of perhaps 80 acres, which could be developed in conjunction with new housing, so you are contributing to integration through outlying housing production in combination with school facilities on some scale.

There are few sites in Philadelphia big enough for that.

We had to find some kind of an answer different from the standard answer that you see on the right, where two standard middle schools following the minimum site standard of four acres inevitably causes a great deal of relocation. For such school site standards there simply are not sites available. We had to find a way to take the schoolhouse apart, and we had to get the educators to agree to an educational notion that kids can learn just as well through travelling from one place to another place as in one building. So we developed (in the diagram on the left) a concept of how the program ingredients in the school could be broken up into their discrete parts, and reassembled in joint development complexes of various sizes and types.

On the right is a "satellite core" concept, in which we take a major regional transit center, such as North Philadelphia Station, and around it, develop a complex of high and middle schools, housing, and other developments, as a way to produce readily-accessible school facilities within the inner-city, but on a joint-use basis.

On the left is another kind of an idea. For those of you who know Philadelphia this system is strung out along Broad Street or Market Street, both of which are served by Subways, with major school complexes located at the subway stops. Working off these centers, where are placed highly-specialized types of educational complexes, there would be umbilical cords of services reaching into the neighborhoods where elementary schools and local services are provided. But these interior schools would be sustained and supported by more specialized educational programs provided on the main streets served by the public transportation systems.

From this study, we were asked to go further into developing a prototype school building system for North Philadelphia. The map on the right indicates some of the research that was done that indicated the availability of lands free of relocation constraints for the building of a massive school program in North Philadelphia.

On the right, you see the component elements divided into their discrete architectural masses, the school spaces, housing, and recreation being shown as separate sub-systems. The concept is to find a kit of parts for the school system that can be fitted into different locations and situations.

So (on the right) the main specialized elements of the two middle schools-complex are put out on the main street and developed jointly with high density residential and local commercial uses. The individual academic functions and some of the specialized gymnasium and other recreational activities are put, opportunistically, back into the neighborhood. On the main street where the main complex is, there are special transit systems that would link this complex to others back on Broad Street where the subways and much more specialized educational systems would be.

(On the left) Here is a kind of illustrative plan for the entire area of North Philadelphia, an area of 400,000 people, which would result from taking this versatile set of parts and putting it together where it was needed most badly in terms of the social pathology of the area and could be accomodated in terms of the kinds of sites that were available without relocation implications.

But this kind of thinking about education is only possible at the point when one begins to recognize the possibilities of mobilizing movement systems as part of the enabling physical apparatus of the school.

Our work in the model new community for Fort Lincoln, in Washington, D. C., which was commissioned by the Johnson Administration in its closing year, is another example where we have wrestled with the use of transit and pedestrian movement systems to enable innovation in social interaction and educational programs.

In this case, our concern was producing a new community of 4500 families, a mixed racial and economic group, under circumstances that are less than favorable because of the location of the site in the midst of a lower-middle income black area of Washington.

Our approach to this problem was to greatly emphasize an outstanding educational system in the new community which would serve not only the residents of the new community, but provide enough capacity to import many students for the school system from outside the site. The plan is based upon the adaptation of a mini-rail as a local transit system within the community. This is shown in yellow. This would connect to the Penn Central Railroad and the highway which would go through the corner of the site, and an additional external mini-rail system would go down the Anacostia River to make connection with subways planned in the central part of Washington.

The mini-rail was introduced as a key device in producing social integration of this diverse population within this community, and as a device for minimizing the space required for parking and vehicular circulation within the community. I should mention that the plan is based upon a series of subcenters served by the mini-rail, as shown on the right, each of which provides a certain range of neighborhood services and several of which serve area-wide services of a shopping and educational nature. The idea is that no one center is entirely sufficient to serve all of the needs of the neighborhood people that can walk into it, but each center provides something special that is required by all other portions of the community. This becomes feasible to do because of the convenience of the mini-rail system which links each of the centers together.

Here, we see a close-up of the mini-rail system going to a stop at this point and crossing from one area to another. On the right, you see a representation of what such a subcenter might be like.

Around the mini-rail at each of these subcenters a complex of school facilities providing a "learning center" for all ages of school kids. Each "learning center" is assigned a special function to perform for the kids in the total community system.

Some, in science and technology; some, in performing arts; some, in business and other functions, so that a good bit of the educational experience is gained in the context of a real world relationship to other things that are going on. And the architecture of the school building is de-institutionalized and joined with commercial or residential uses.

The final example in our project experience of involving transportation as a basis for social and cultural interaction, is our work in the Twin Pines-Spring Creek area in Brooklyn, New York, for the New York City Planning Commission. This is a project where there was an announced program for 6,000 units of middle-income housing by United Housing Foundation, which is the developer of a number of major building projects in New York, and we were asked by the Planning Commission to develop a set of guidelines for this particular project as a basis for a quid pro quo between the City and the developer. We felt that one of the key ideas was to get the developer to recognize that he had to produce interaction between his development and much broader social groups outside of the area, instead of the walled city that he was used to doing in other projects. Within his development, he needed to take certain community facilities and arrange these in a relationship that would allow a great deal of interaction back and forth and a shared community experience. So we suggested a spine relationship to commonly serve the individual clusters, and on this spine the schools, retail, recreational services, and health services would be organized in a kind of a multi-use relationship that would allow common services for all of the three major residential neighborhoods. On the right, you see an illustrative design of this general principle that was suggested to him.

This is the larger area of which the Twin Pines area is a part. The plan for the broader Spring Creek area, while employing some of the same concerns of producing a key focal spine for social and cultural interactions, is perhaps an example of another key concern in transportation; i. e., working with the synergistic possibilities of systems design and development at the broadest environmental levels.

At the largest levels of development planning, I think we have the opportunity to work with the interrelationships between systems in a versatile manner, and the relationship of these to the supporting of development programs and use of development programs to support and justify the kinds of movement systems that we would most like to implement. In particular, public transportation is very hard to justify in most cities today, unless you can control the degree to which there is high-density development, producing users of public transportation in very close association with regard to the development of mass transit construction.

In Spring Creek, as shown here, we are looking at a development in an area once serving as a dumping ground facing Jamaica Bay. The existing urban area comes up to a sharp edge with a vast, vacant acreage along the Bay. The Cross Brooklyn Expressway was assigned to cross this area. The key question was, how do we develop this area? How do we find a route for the Cross Brooklyn Expressway? How do we relate that to maximizing development potentials of the vacant area

and service to the existing area.

After a number of alternative locations for the Cross Brooklyn were studied, we chose one just at the edge of the vacant area where the accessibility would be supportive of the existing area as well as giving access to new development markets in the new area. In that edge area between the old and new development, we decided to place a great many regional school systems, commercial developments, high-density housing for mixed occupancy, and other things that would begin to be a functional seam between the new and the old.

On the right, you see a sketch of this spine concept. We looked at various ways within that spine to integrate rapid transit extensions with the highway development, exploring various transit technologies and their ability to reduce the total capacity requirements for the highway.

Here, you see on the left a view of the spine development with the Cross Brooklynn here and paralleled there by a coupled and supporting service road to take on some of the functions that will help to reduce the total capacity requirements of the expressway. (Every great road needs a parallel "little brother" to share some of the jobs that would otherwise overload and de-specialize the main system.) In between, major regional schools, high-density housing, and retail developments would develop.

On the right, you see a diagram of some of these major community functions that would be located in the spine. From that basic concept of a functional area, we then developed a more elaborate systems design for the vehicular circulation, as well as exploring various kinds of transit systems that would relate to the corridor.

We were employed by the New York State Office of Planning Coordination to study the possibilities of rapid transit integrated with new urban vehicular systems linking downtown Buffalo, to the existing Main Street campus of the University of Buffalo, and to the new suburban Amherst campus of the University. In connection with looking at these transportation potentials and needs created by the expansion and relocation of the University from their Main Street to the Amherst Campus, we were asked to explore development opportunities for the City's, Amherst's, and the University's mutual benefit, such as: housing, schools, economic opportunities, and distributed University programs. These would both support the University's urban role, answer needs of City residents, and minimize impacts of University growth in its new suburban outpost.

This study led to a subsequent transit feasibility study, which will be included later in my talk tonight, and the overall corridor development concept has become a basis of Governor Rockefeller's policy of state investment in Buffalo.

On the left is a drawing simply showing the corridor (in orange) where the proposed line-haul transit system from downtown Buffalo to the suburban campus would run, and (on the right) there is a diagram of some of the major development opportunities that we identified to go with various vacant and undeveloped areas served by this corridor. The solution related also to vehicular systems development opportunities of a type that could be fitted into the rather strict social and environmental constraints of the inncer City.

On the left are various principles that were taken into the organizing of this synergistic relationship between development and movement systems. On the right is a diagram indicative of the kind of research that was done regarding constraints of the existing neighborhoods and street spaces available for the insertion of these movement systems. These studies led to recommended patterns that would minimize disruption.

These are indications of some of the major opportunities for joint development that we foresaw.

This (indicating) is an abandoned quarry which we saw as a place for major housing and schools to be developed as a kind of a new-town-in-town, with a transit system operating through the development in this fashion (indicating). This is the existing campus of the University of Buffalo, where we saw the opportunity to develop the front lawn of the University for housing that would satisfy both University and neighborhood needs as well as supplying much needed parking.

The transit system comes into the Main Street campus on its way to the suburban campus so that it can both serve the campus and minimize neighborhood impact.

Our work for the Bicentennial in Philadelphia is the other project that perhaps relates to the idea of synergistic design of movement systems and development planning at the broadest urban levels. I must admit to you that this Bicentennial project is now defunct, and Philadelphia's present approaches are of a different order of concern now. However, for the two years when we thought we could get the Bicentennial turned around towards urban purposes, our approach was that we would develop an exposition with three major centers: one at the historic Penn's Landing area of the Delaware River in conjunction with a piece of vacant waterfront land in Camden; second, a major air rights development at 30th Street Station facing the Schuylkill River, so that downtown Philadelphia would be straddled by these two centers, one providing the historic focus, and the other providing the international exposition focus. The third one was at North Philadelphia Station, served by the Penn Central Railroad in the heart of Philadelphia's biggest black ghetto, where we proposed to develop a model urban center that would demonstrate some of the social and environmental contributions that should be made to the improvement of conditions in the inner city.

We felt that it was possible because of good existing transit connections between those points and because of the desire to further develop these connections to allocate these kinds of developments to such a very broad territory.

And this 3-site approach was the only basis on which we could find the space in anything like the scale required for an exposition within the inner part of Philadelphia. Permanent re-use of exposition development as well as provision of needed community improvements further justified the dispersion of the exposition.

Now between these sites, various improvements in the existing transportation system were proposed. An example is the Chestnut Street system, linking 30th Street to Penn's Landing. This involves conversion from a vehicular and shopping street at present to a future pedestrian and transit mall. On the right is a drawing of an earlier concept that the City Planning Commission had of simply putting a streetcar into this area. But we saw it more as a rubber-tire vehicle, which could sometimes operate at grade and sometimes above grade, because of the rather varied conditions of Chestnut Street. There are areas where it has to cross the Schuylkill River and share those crossings with vehicles, and there are other portions of Chestnut Street where the vehicles can be eliminated and the space given over to the transit. So we felt the need for a versatile type of mode that could meet various kinds of conditions in this river-to-river connection.

This is the 30th Street area. On the right, you see the tracks. On the left,

the areas adjacent to 30th Street: the Schuylkill River, the Art Museum, the Universities of Pennsylvania and Drexel, all affected by this development.

Now in the next few slides, our concern focuses down on a more local level. We move away from the broadest city-wide levels of movement system design to the creation of an infrastructure that is responsive to the built environment of a discrete area.

At this level of environmental design we begin to look for transit systems that link the major line haul rapid transit to the individual local destinations. It is at this point we begin to think in terms of so-called people-mover, systems of minirail variety, carveyor, things of that sort. Too much difference has existed between our major rapid transit and our expressway systems on one hand, and the needs of the individual in terms of getting to his own private destination, on the other hand.

On the left is a diagram of the relationship between minirail, pedestrian, and moving-belt systems that would be used in the main site at 30 Street. On the right is one of the site plans in an evolving series of studies that were done for the 30th Street area, in which project we had the help at certain phases of the office of Mitchell & Giurgola of Philadelphia and New York.

On the left is the multi-mode infrastructure system that was developed for the 30th Street area, with the major expressway system, including a bypass of the Schuylkill Expressway shown here in red, each with service roads at different levels. In the orange, the major parking access from the service roads of the expressway. In the green, the major pedestrian and moving-belt systems and other rapid transit and local people-mover systems. All were structured in a multi-vector grid providing for diversified directions, connections, and separations.

On the right, you see a study of this in three dimensions. These studies of infrastructure illustrate, among other things, the search for versatility, not only of directions, but in terms of levels, a search for very rich possibilities of connections and different relationships.

This was based upon a structural system that was oriented to the solving of long-span problems caused by the tracks of the Penn Central and the need for a structural approach that would respon to different kinds of space uses stacked vertically with respect to each other. We did not expect to be able to take the loads of the highest office buildings on this structural system. Those would have to come down to their own foundations; but up to 10 or 12 stories, we could mix uses in almost any combination without penalty to the structural cost of a given use.

This is a key problem in air rights and mixed use design involved in this kind of joint development with transportation.

Various alternative land use massings were studied for their transportation impacts. We supported the Bicentennial Corporation air rights value negotiations with Penn Central Railroad by proving that the transportation connections available to the site at the maximum would only support 20,000,000 square feet of development ultimately, whereas, the Penn Central (without logical reference to access constraints) anticipated an opportunity to create at least 40,000,000 square feet of development on only one quarter of the site under negotiation and planning.

So there was a great deal of analysis of the total development composition and density, based upon the accessibility of the limits of the site, and this was taken into consideration in the configuration of the design and the organization of environmental infrastructure.

In the scheme, you see residential uses facing the ghetto neighborhoods and commercial uses facing the downtown area. The dormitory and institutional uses facing the University and the offices are sited with regard to prime connections with Market Street and the 30th Street Terminal. This composition of uses derived not only from conscious objectives for multi-use development, but because of symbiotic determinants of the access and economics.

These are various level plans on the right. The lowest levels are for parking and are opposite space use on the left. Some of the upper-level plans are for commercial uses.

Here you see the joint development in yellow in the section drawing, which is the parking space, and in orange, the lower-level office and retail uses, housing and office space uses. Over here (indicating), institutions facing a major open space would be paid for out of the revenues produced by the higher-density commercial uses.

On the right is a drawing indicating integration of the built environment with movement systems, where some of the on-site movement systems would be running right through major exposition spaces that could be converted to permanent University and merchandize mart facilities.

In connection with the local infrastructure of a particular area of environmental design, our Fort Lincoln project, I think, makes another point beyond the one we have already made. This is that, through extensive interrelationship of a transit and street system, we can begin to save vehicle space for on-site roads and parking. We can cut down ridership.

We can, as indicated here, with an external subcenter bring an interchange with external bus systems and park-and-ride facilities that relate to the on-site mini-rail. Through maximizing the internal use of transit as a means of getting around in the community, we can reduce the space required for parking and for on-site roads by a great deal and save that space for use as open space and for increased facilities of one kind or another.

Through sensitive interrelationship of these factors, we were able to get fully 50 per cent of the parking into structures rather than open parking lots, and this in a community where a very large percentage of the housing is for low and moderate income people. Here you see a rendering of the housing quality. On the right you see some of the housing types where we would have parking in structures and use of the space above for recreational use, All of this would be able to be financed because of the total density of site uses enabled by the transit technology and reduction of space wasted in parking.

At the same time, this technology is one that is quite comfortable to live with. On the left, you see a rendering of the mini-rail as it would pass through one of the subcenters and it reminds us of the kind of quite acceptable relationship that we experienced at Expo '67, between the pedestrian and the vehicle.

Now in these projects like Fort Lincoln, we are dealing with pretty dense new communities. In Buffalo, on the other hand, we are dealing with the problem of fitting movement into an existing tight urban community. In these areas, responsive environmental design in an urban neighborhood suggests a great deal of very careful surgery, very careful relationship between the space for movement and the architectural characteristics and the inhabitants of that neighborhood. Choosing between places where we must tame the movement down to fit, as indicated on the top of the drawing, or cases, as shown in the bottom of the drawing, where there is an opportunity for maj-

or development without relocation, where we can have a much larger scale of movement.

In the new community for Lysander in up-state New York, planned by our office for the N. Y. State Urban Development Corporation, we have been quite concerned to respond to the natural qualities of that area. This represents still another kind of environmental responsiveness in movement design. It is a beautiful woodsey site in low density condition, and in that case, we have been quite concerned to present streets that had a natural, open, characteristic, as shown in the integration of the open space system and the street system on the right. While the architect usually thinks of streets as needing architectural definition, they sometimes want a sense of the non-manmade.

Using the landscape vocabulary, we have given a signature to each of the different types of streets, and we have taken, as a key criterion, that one should never have to look at the various developments and houses (that will be quite beyond design control) from these main streets. One should have the feeling of passing through woods through a very major part of the town.

And yet, each street would have its own particular character of landscaping as an aid in knowing our way around. A key planning concept of the town has been that there will be a discrete town center of distinctly architectural and manmade character, and 30 per cent of the houses will be in moderate density neighborhoods in walking-scale distances from the town center.

So this is a town that gives support to the idea of the motor car and also to the pedestrian, and gives a choice of environments.

A great deal of effort was given, then, to the location of facilities so as to maximize walking-scale opportunities to schools, recreational facilities, and so on, to relate these, in turn, to the scales of different streets and pedestrian ways as shown on the right, which would be linking the pedestrian to these areas. The major school components, again, would be located with the high and middle schools concentrated for driving into from the town or walking in from the compact neighborhoods on either side of the town center. This synergistic relationship between the upper schools system and the town center provides opportunities to create a more viable town center than we could otherwise support with a community of 5,000 families. The lower schools would be more dispersed, on a walk-in basis of relation to housing throughout the town.

The next projects deal with yet another and more local level of transportation design: the architectural definition of circulation space.

At the most local level, the urban street becomes a living room, becomes a place for social interaction. Our Operation Breakthrough Project in Jersey City is a project which has been very much concerned with producing this kind of social interaction through on-site pedestrian movement systems from the vehicular systems. Jersey City is a city that I once studied along with Dick Dober to find out why it is so ugly; therefore, when we were assigned to work on the Operation Breakthrough Project there, I was somewhat nonplussed.

But you can get 20 feet off street grade on this particular site and then you can see this view of Manhattan's skyline. In the other direction can be seen the Jersey Meadows. There is thus the possibility of moving above the tawdry atmosphere of Jersey City and sensing the regional connections, if you can just get high enough off existing street grade.

So the project has been organized to maximize these views and to maximize family living for a mixture of 60 per cent market-oriented housing families, and 40 per cent moderate and low income. Trying to produce that kind of social integration in such a small, tight space is very difficult.

We used the device of what we call a "route building", or a raised interior street. This offers views of Manhattan and gives entrance to all of the three and four-bedroom apartments for family-living. This route provides recreation, communication, information. It is the basic point at which we produce the integration between the social groups.

Planning of the sizing and pricing of the various apartments around this route with regard to placement of the elevator and stair towers was a key discipline in the planning of the project.

The route is seen as the public living room. I will take you through some of the developments of the public environment of this route. On the left, the movement systems' concepts. On the right, the recreational and landscaping notions in which playing is seen as a basic adjunct of movement. The two are not divided but linked.

And here, a later development of the model, and on the right, some of the criteria used for mixing of the different family sizes.

Here is shown locations for development of joint non-residential uses in connection with housing and parking. The design of circulation architecture, I think, is a particularly important part of the challenge in becoming more responsive to the demands of movement systems design.

Here is one project for two commercial clients on a hot vehicular street outside of Philadelphia. They asked us to develop the feasibility of higher and better uses for properties that they owned, in which they could produce multi-level vehicular access and pedestrian shopping concourses, with ample parking easily visible from the street, and in which they could, perhaps, include some recreational and apartment developments. The clients had been to the multi-level shopping arcades in Stockholm and were curious to see whether such projects would be feasible in Philadelphia in competition with one-floor shopping centers on the same boulevard a few blocks down, which had open-lot parking.

We were able to prove that, in economic terms, this would be feasible. One of the clients happened, however, not to have the cash to be willing to invest in the project, which required cooperation between the two. We used a very plastic approach to the use of concrete in order to bring the automobile into clear view from the main street, which is out in front, and to bring the automobile onto some of the same floors with the retail activity and to get more than one retail floor, which we could sell at premium prices, and in the process, begin to get a kind of synergistic relationship between the various uses.

Now this project is a purely profit-making venture for a very isolated condition. It does suggest some of the growing preoccupation with multi-use design that we have been called upon to do in connection with tough sites and new kinds of motives. This project (indicating) in Buffalo is perhaps more indicative of the community-oriented concerns that joint-development planning triggers.

In these community oriented projects, we are often attempting to find new institutional connections between the university and neighborhoods, between neighborhoods and major transportation development authorities, and so on. Here, we are trying to produce

housing, schools, health facilities, educational/cultural facilities of one kind or another in connection with opportunities that are perhaps brought about by the transportation system.

As shown on the left, we would like, in some cases, to break down the walls between the universities and the neighborhoods that abut them. We would like to break down the walls between high-income neighborhoods and low-income neighborhoods that are often separated by proposed expressways. But the uses that will bring about interaction between these kinds of users are often of low density or produce little revenue to their developers.

The project on the right, which is an air rights project for the 30th Street complex of Philadelphia, exemplifies one key fact about air-rights site conditions, and that is that they are costly and it is extremely difficult to make all of these nice ideas about joint development and air rights really work for the needing community groups.

In that connection, we have developed an air rights model which enables us to quickly get at what some of the penalty costs for structure and site conditions are under various conditions and how these relate to different combinations of space uses and densities that might be involved in a neighborhood improvement program concept.

We have developed this model in such a way that it becomes possible for a wide range of alternative programs and design concepts for particular air rights' projects to be developed and tested for economic feasibility rather rapidly, before too much time and money has gone into the design.

Such a tool, which enables exploring different alternative uses for the same site, can be put in the hands of community groups so that they can do some of their own thinking and deciding in conjunction with major transportation development teams.

This leads me to the final point that I would underline in this presentation, which is that, if we are going to develop responsive approaches to transportation design, we have to have methods of design that are responsive to social and environmental criteria.

In our Buffalo Transit Feasibility Study, following the earlier regional land use transportation study, we were able to develop some systems of looking at the specific implications of alternative modes and paths with respect to different areas of the city.

In this study, we were able to look at alternative routes and alternative station locations and study them with respect to specific users and then, (slide) study them against all users combined and select a final system of routes and stations that would optimize the services to all users.

We did a study for the Crosstown Corridor for Philadelphia, where we were the urban design consultants in a larger concept team headed by Allan M. Voorhees Associates. For years and years there had been a proposal to develop a major expressway across the southern end of the Central Business District of Philadelphia, from the Schuykill River to the Delaware River, and this had become a fantastic controversy between business and state highway groups on one hand, and neighborhood groups on the other hand. The consultant team was brought in to study this whole situation and to recommend whether or not the facility was needed, and if it was needed, alternative designs.

Our approach was based upon starting with the first question which was, do we need a facility in this location?

We studied transportation demands to the central business district, past the Central Business District, and to the South Central Area through which this expressway had been long planned, and we discovered that only 37 per cent of the total trips were through-trips from river to river, and the rest were destined either to the Central Business District, to the study area, or to other locations that could be satisfied by other facilities.

In the meantime, this long-planned expressway had caused a lot of deterioration and construction in the area simply because of anticipation of the expressway and the need was to come up with some kind of a solution that would clear up the matter once and for all.

While looking at the regional solutions, in order to determine whether or not there was a need that would justify the facility, we were also simultaneously looking at the impacted South Central Corridor, which is one of Philadelphia's most blighted urban ghetto neighborhoods.

We studied the structure of community groups, various physical conditions, social conditions within the area. We evaluated what could be done if a facility was needed in the way of alternatives. We developed nine different alternatives in plan and in section, and these were evaluated against a wide variety of criteria and measurements.

And on the basis of these evaluations, a final solution was found to have the greatest benefit/cost equation. This was simply a spur development from the Schuykill Expressway feeding core-destined traffic to the Central Business District, linked to improvement of an existing Washington Street at major local street standard rather than expressway standard, coupled with parking improvements and other direct ramps off existing expressways into key areas of the Central Business District.

This is possibly the only national controversy in transportation which resulted in unanimous approval on the part of the citizens group that was monitoring the study. This could only have occurred because of the kinds of methods that were used that placed the objective determining of heads first, design of the system second.

In conclusion, these projects perhaps illustrate what I mean by the social and environmental responsiveness that is needed in transportation design. I have long felt that the highest and most important objective of the urban architext is the dissolving of physical inhibitions to fruitful social interaction and communication in cities. Cities are basically places that want to exist for communication, and cultural and social interaction. They want to enable freedom of association, freedom for the organization of various kinds of human activities and behavior patterns.

Our buildings and our artifacts tend to be constraints on these associations and these relationships, and it seems to me that the most important architecture is the architecture that is invisible; that is totally dematerialized; that will allow completely free human associations.

I think the key to the architect's ability to dissolve the physical constraints on human behavior and organization is his involvement in movement systems design.

We have long stayed out of this field. We have long relegated it to the province of the engineer. We have long assumed that it belonged to a public sphere, but it is becoming increasingly a concern of interdisciplinary collaboration.

If, to this growing field of interdisciplinary activity, the architect would like to bring some kind of contribution, he needs to bring a formal vocabulary that is broader, more diversified, richer in its possibilities for the liberation of urban infrastructure. He needs

to bring a repertoire of rational methods of design that will allow objective formulation of alternatives and evaluation of these according to multi-purpose, rather than single-purpose, criteria. He needs to bring to his work a respect for social and environmental values and less preoccupation with the technocratic faiths that have, in the past, suggested that a road should be a straight line.

MR. DOBER: David is willing to answer questions. I will open it to anyone who has comments or reactions to what I think has been a most provocative and incisive two hours of sensitivity about this oncoming now issue.

Any questions? Comments?

FROM THE FLOOR: What is the basis for trying to integrate the middle-income and low-income housing with high-income housing? Don't you have an inherent conflict between the social desires of those people with high income as opposed to those with low income? And how do you balance these different characteristics of the people in bringing them together? What considerations are given?

It is all very well to go in and say "Wouldn't it be nice to have a low-income and a high-income housing together?" But when you get down to the people, themselves, they quite often don't want to be in the same areas, I believe, and what consideration is given to that?

MR. CRANE: Well, first, I think it would be a long subject unto itself to talk about this. The social value of social integration in housing. But let's say that when we are talking about movement systems that our objectives should, at the very least, be to enable associations that have not been enabled in the past.

And I think that the key issue in all housing is choice, and if our movement systems as well as our housing facilities are separated and segregated, both by the movement systems and by the specialization of housing facilities in different locations, then there is very little choice.

It is not easy to produce integration and not necessarily always desirable to have a total alphabet soup of all parts, as society, in any one small space.

TECHNOLOGICAL OVERVIEW OF PASSENGER OR TRANSPORT POSSIBILITIES

WILLIAM SEIFERT

William W. Seifert, Professor of Electrical Engineering, Professor of Engineering in Civil Engineering and Director of Project Transport at MIT. Since 1964 Project Transport has carried out a continuing program of research in support of the office of High Speed Ground Transportation in the U. S. Department of Transportation. They have also studied long-range, in-depth means of improving the safety and efficiency of highway transportation. He has written reports on the roles of public and private enterprise in transportation and on its future. He is the author of Air Transportation, 1975 and Beyond: Control Systems Engineering; and numerous technical reports and articles.

PROF. SEIFERT:

Previous speakers in this series have described ways in which transport systems have shaped our urban areas, for good and bad, examined the increasing role communities are playing in blocking construction of facilities to which they are opposed, and discussed the particular problems of providing improved transport systems in the Boston area.

My assignment this evening is to discuss some of the technical concepts that have been put forward as possibilities for providing improved transport and to discuss the potential of these systems, at least as I see the picture.

Predicting whether and to what extent particular technical innovations will become important has always been a risky business and it is doubtful that I shall be anymore successful than others at foreseeing the future. However, we can look back and observe that out of the host of new transport ideas that have been put forward during the past century, only a few have proved to be significant. However, these have brought about profound changes in our patterns of living. Each of these advances has been built around an advance in propulsion systems. The automobile was made possible by the development of the simple reliable, relatively small, and relatively inexpensive gasoline fueled internal combustion engine. The railroads of the country were given a new, if temporary, lease on life by the development of diesel locomotives to replace the old steamers. This change reduced locomotive maintenance requirements drastically and significantly increased the miles of service a locomotive could provide in a day. Likewise, the introduction of jet engine aircraft led to a decade of spectacular growth in air travel.

Having noted these three cases one becomes hard pressed to identify other technical advances that have in this century led to significant changes in transport systems. We might furthermore observe that each of these advances actually had an evolutionary history and with reasonable foresight one might have been able to identify the important advances well before they began to be of real significance. It is difficult at this point to identify comparable advances which offer definite technical advantages and which simultaneously can be integrated economically into the existing transport systems.

The difficulties involved in introducing new systems and integrating them into existing systems have increased significantly as the investment in existing systems has increased. This factor may, in fact, prove to be the major deterrent to the introduction of any really innovative technical advances. We will return to this point later but now let us examine some of the technical concepts that have been advanced for improving our transport systems.

Today's urban transportation problems stem primarily from the fact that the automobile has been so successful and has been embraced by nearly everyone who could afford to own one and was qualified to obtain a license. The privacy, convenience and ubiquity of access provided by the private car has been unbeatable. However, the seeds of difficulty lay in these very attributes. The major cities of the world all suffer from traffic jams and as new expressways have been built to relieve these jams great swathes have been cut from the very hearts of our cities. Furthermore, congestion in the central cities has caused people, stores and commercial activities to flee to the suburbs leaving the core cities still crowded but with severe economic problems.

Innovative Transport Systems

Beset with severe problems of congestion coupled with geographic restrictions and citizen reaction which limited the building of additional highways to serve the region, San Francisco began nearly a decade ago the design of an extensive rail rapid transit system to interconnect the city with the area on the east side of the bay. This system is now nearing completion and service on part of it is scheduled to begin later this year. Although there is little about the system which is really innovative, the best available technology has been employed and careful attention has been given to the aesthetic design of the at-grade and elevated portions of the system, to the stations and to the cars so that the system will be pleasant to look at as well as to ride on. The cars are electrically propelled and the entire system operates under the command of a central computer which controls headway between trains, stops the trains at the proper location in stations, opens doors, etc. This control system will permit the 90 second headway between trains and 80 mile an hour operation which are held out as the major attractions for the user of the system.

The designers of the system expect that many who commute into San Francisco will forsake their cars and ride this new BART system. In support of their expectations, real estate prices along the rightaway are increasing rapidly. Other cities faced with traffic congestion eagerly await the initiation of service to see whether this super subway will attract the patronage claimed or whether it will prove to be a 1.3 billion dollar albatross around the necks of those Bay Area communities who joined in the construction of the system. Soon some indicators will be forthcoming. In the meanwhile, most cities are waiting.

Probably the greatest technical advance in the BART system is the computer control system. To be sure, the system does use a wide gauge track, the tubes under the bay do represent a major construction feat and innovations have been introduced in a host of areas ranging from improved braking to improved power collection systems. Nonetheless, the systems remains basically an improved version of the steel-wheel steel-rail electric subway system which was opened in Boston in 1897.

Several attempts have been made to modify and improve this basic configuration. One line of the Paris Metro uses rubber-tired wheels riding on concrete treads and a similar system was selected for the recently completed Montreal subway. These systems are somewhat quieter but they cost more to operate.

In the mid-sixties Westinghouse unveiled its new transit system called the Skybus or Transit Expressway. This system employs rubber-tired vehicles about the size of a bus, uses electrical propulsion and operates under computer control. Steering is achieved by pneumatic-tired guide wheels running on an I shaped section mounted between the roadway beams. The system is thus not greatly different from a rubber-tired subway. However, the cars are much lighter (18,000 pounds compared with 78,000 pounds for a New York subway car). As a result, elevated portions of the structure can be of much lighter construction. The principal obvious technical problem with the system appears to be the need to use some type of transfer table for switching. Such a system is acceptable for a simple loop installation as in South Park, but would seem to be very clumsy for use in a real network system. A system to demonstrate the concepts was installed in South Park in Allegheny Country, Pennsylvania, and during the September 1965 fair some 14,000 visitors rode the system. Their response to the experience was very good but in spite of substantial efforts by Westinghouse, no definite agreement to build a reve system has been reached. However, Westinghouse is installing a closely related system to carry passengers from the main terminal to the loading areas within the Tampa airport and a specific proposal is under discussion to build a 10.5 mile Skybus line between South Hill Park and downtown Pittsburgh.

The Aerotrain, which was initially conceived by Jean Bertin and is being developed by the Societe de l'Aerotrain, represents a substantially more technically advanced system to serve as either a suburban transit system or or as a high speed interurban system. The vehicles ride on a cushion of air which replaces the wheels and the conventional suspension system. The first experimental Aerotrain system was demonstrated on a 4.2 mile long test track in Gometz-la-ville south of Paris in 1964, and a continuing program of experimentation and development has been carried on since. Figure 7 is a view of the girst prototype vehicle. It straddles an inverted T-section beam and compressors within the vehicle supply air at about 0.6 psi to air cushions on the bottom of the vehicle for lift and on either side of the center section for guidance. The advantage of an air cushion system is that it offers the possibility of providing a very smooth ride at high speed without requiring that the guideway maintain precision smoothness.

Because there are no wheels through which to supply tractive effort some other means of propulsion must be employed. The alternatives are to generate thrust either by a propeller or jet or to use electromagnetic reaction between a member on the vehicle and one on the guideway. This first vehicle used a simple propeller.

The next slide shows a later version of a propellor driven Aerotrain on a new 11.2 mile long test track located north of Orleans. The first tests with this vehicle were made on September 10, 1969. Because even a shrouded propeller generates substantial noise, it is envisioned that this type of vehicle would be used only for intercity operations. The vehicle carries 80 people and cruises at 155 mph with a design top speed of 186 mph.

For quieter operation in a suburban area, it is proposed that propulsion be provided by a linear induction motor. The basic configuration of such a motor is shown schematically in Figure 9. It consists of a primary which is a linear version of the windings in an ordinary induction motor such as used in a washing machine or other appliance. The secondary takes the form of a continuous beam of conducting material--usually aluminum.

The guideway built at Gometz to test the suburban air cushion vehicle is shown at the right in Figure 10, while Figures 11 and 12 show the vehicle itself. This is designed to carry 40 passengers and to cruise at 112 mph.

A French consortium group is now promoting the construction of such a system to connect Orly and the new Airport at Roissy with Etoile and Joinville.

The British are also experimenting with air cushion systems and our own Department of Transportation has put considerable effort into the air cushion concept. It has supported detailed vehicle and guideway design studies as well as the design and construction by the Garrett Corporation of a full-scale linear induction motor which will be tested initally on a wheeled vehicle. This was scheduled to be delivered to the new Pueblo, Colorado, test facility of D.O.T. about the end of April 1971.

D.O.T. has also been surveying the possibility of building tracked air cushion systems to serve Dulles and the Los Angeles County airports, but Congress recently vetoed the request for funds to build the Dulles system. However, Grumman Aerospace Corporation has been awarded a $3.5 million contract to build a four-man research vehicle to be completed by March 1972.

The air cushion concept certainly is one of the more exciting technical developments in the field of passenger transportation. However, these systems, like conventional subways, are designed to serve specific end points. For certain situations where large numbers of passengers want to travel between specific points such systems may prove very attractive. However, they cannot hope to replace the automobile to any large degree for general urban and suburban transportation.

The gravity-vacuum tube system represents the most technically innovative of the subway-like systems. In this system, vehicles are propelled through a partially evacuated guideway by the combined action of the differential air pressure acting on the head and rear ends of the train and of gravity. The vehicles fit snugly into a tube and are supported and guided by steel wheels riding on precision steel rails. The guideway itself is in a tunnel which begins near the surface at a station and slopes downward to a depth depending on the distance to the next station. The entire tube is evacuated and when a train is to leave a station valves ahead of and behind it are opened and under the action of the differential pressure and the downward grade the vehicle accelerates. It reaches maximum speed at the bottom of the slope and is maintained at this speed, by control of the air pressure behind it, until it begins to ascend to the next station. Under the decelerating action of gravity and compression of air ahead of the vehicle it is brought to rest at the station. Larry Edwards, the promoter of this system, claims it should provide comfortable, safe travel at speeds up to 400 mph, but no substantial experimental verification for this claim has been demonstrated or appears likely to be in the near future.

The system is even less flexible than an ordinary subway, since it will be built at a greater depth, and would be best adapted for very high volume operation with large trains running at a minimum of several minutes headway. There are also serious technical and economic questions including concern as to whether the rails can be kept insatisfactory alignment to pro-

vide a comfortable ride at high speed and the high cost of tunneling. Mr. Edwards spent a great amount of effort between 1965 and 1969 attempting to interest a variety of groups in building such a system, but activity has been at a standstill for the past year or more.

Movement over short distances in congested urban areas or within airports or other high density activity centers presents a different set of problems and has elicited a different group of solutions. I mentioned earlier the fact that a system related to the Westinghouse Skybus is being installed at the Tampa airport. Varo, Inc., of Garland, Texas, has demonstrated a competing system which they call Monocab. It is basically a horizontal elevator in which the cars are suspended from an overhead rail. The system operates at a maximum speed of about 15 mph and is completly automatic. Each car holds 6 passengers. A number of systems with more or less comparable characteristics as well as moving sidewalks and other people movers are being investigated by other groups. No doubt a number of such systems will be built and will serve well in specialized applications.

For nearly a decade a group at MIT, at first small but now growing, has felt that the American public is so wed to the automobile that it will be difficult to lure people out of their autos into any system which does not retain the basic flexibility, privacy and convenience of the present automobile-highway system. We believe that a major effort should be made to modify the automobile to make it safer and more efficient rather than to scrap it in favor of some unproven concept or one which over the years has proven only mildly acceptable.

The two avenues that appear most promising for further development of automobile-like vehicles are the areas of propulsion and control. The attention currently being focused on the problems of atmospheric pollution and the large contribution of automobile exhaust to this pollution have created a resurgence of interest in electric vehicles while the congestion of our highways coupled with the high accident rates has led to a search for means to increase the flow of vehicles over the highways while reducing the accident rate.

One must be cautious, however, in appraising the extent to which broad social concerns influence individual actions. Some citizens will become sufficiently concerned over issues such as pollution that they will voluntarily minimize their own contribution to the problem even though their neighbors may not and even though their own action may cost them money. However, in general, individuals will take courses of action which minimize their immediate costs or maximize their comfort or convenience. Consequently, it would appear that a massive shift from internal combustion automobiles will take place only if a less expensive, or more comfortable and convenient, alternative is offered or if stringent legislative controls are imposed on the use of internal-combustion-engine vehicles. In as much as the latter course of action appears unlikely, I believe a significant change will occur only if a substitute can be found which the public will widely accept as "better."

Let us look at the possibilities for electric vehicles in this frame of reference.

Experimentation with electric cars has been carried on for over 100 years and commercial electric vehicles were manufactured in this country as early as the 1890's. However, commercial production of electric cars, as such, ceased in the late 1920's. Nonetheless, special purpose electrically powered vehicles such as fork lift trucks and golf carts have been rather widely produced for the past twenty years. The absence of exhaust fumes and noise have certainly been prime considerations in the applications found to date for electric vehicles.

What do the possibilities appear to be for building an electrically powered vehicle which would be truly competitive with present day internal combustion engine autos? In order to examine this question, let us look first at the power and energy required to propel a vehicle under various conditions. Figure 16 gives the power required for a vehicle with a total weight, including occupants, of 2,000 pounds to run at steady speed on the level, to accelerate at 3 ft./sec.^{2}, and to climb a four percent grade. From this figure we can see that less than 3 hp is required to maintain steady, level driving at 20 mph, but that this requirement increases to approximately 80 hp to drive at 60 mph up a four percent grade while accelerating at 3 ft/sec.^{2} Also, a total energy of only 5 kilowatt hours as measured at the output of the conversion device, would provide a range of 50 miles for steady driving at 20 mph, but 50 kilowatt hours are required to provide a 200 mile range at 60 mph.

Figure 17 superimposes the vehicular energy and power requirements for this same 2,000 pound vehicle on the characteristics obtainable from a motive power plant, which, including its energy source, weighs 500 pounds. Here, both power and energy are measured at the output of the conversion device. This diagram indicates that whereas an internal combustion engine could provide a range of well over 200 miles at 60 mph of level driving at constant speed no existing battery system could give this performance. In fact, a lead-acid battery could provide a range of only about 50 miles at 20 mph. A silver-zinc battery would provide ample power for 60 mph operation, but would still fall short on range capability. If we examine costs we find that the silver cells give a very high operating cost because of high initial cost combined with limited life in this type of service. Lead-acid batteries offer lifetime costs in the range of 8 to 22 cents per kilowatt hour while the cost of nickel-cadmium batteries would fall at the top of this range. The compact 2,000 lb. car on which Figures 16 and 17 are based would require on the order of 1/4 to 1/2 kwh/mile for city driving or cost 2 to 11 cents a mile for power. By way of comparison, a conventional VW would achieve approximately 22 miles per gallon of gasoline in comparable service. On the basis of 35 cents per gallon (including approximately 11 cents state and federal taxes) this would yield a fuel cost of approximately 1.6 cents per mile. Even if an equal amount is added to account for excess costs of maintenance of the gasoline engine vehicle as compared to the electric vehicle, the cost for the gasoline vehicle still falls at the bottom of the above range even including taxes, which ultimately would be levied on electric as well as gasoline vehicles.

In considering the possibility of utilizing various electric power sources for vehicles, it is also important to assess the quantity of materials that would be required to produce the systems and to compare these requirements with the available supplies. Since lead-acid and nickel-cadmium batteries are the only ones presently available which come near to being attractive economically, let us begin by examining the availability of lead, nickel and cadmium.

Based on an analysis of the requirements of a modest performance vehicle using lead-acid batteries and of the world lead resources, one would not want to say that the resources to build on the order of 15 million electric vehicles by 1985 are not available. However, the picture is sufficiently unclear to indicate that a careful study of this problem is required before any major commitment is made to proceed along this route.

On the other hand, one can definitely state that an annual production of one million vehicles using nickel-cadmium batteries would require at least three times the total world production of cadmium, and that future availability of this metal is strictly limited.

Furthermore, serious technical difficulties exist with the newer zinc-air batteries and the sodium-sulfur cells. With regard to fuel cells we can say that in addition to cost and low power densities, they require a platinum catalyst and some substitute for this must be found if any significant number of fuel-cell-powered vehicles are to be built.

5. A Practical, Electrically Driven Substitute for the Gasoline Automobile

My conclusion from this analysis is that the development of a battery driven electric automobile which would have the range, speed, weight, economy, and general convenience of present gasoline powered vehicles will not occur within the next decade, if ever. This conclusion does not, however, rule out the possibility for developing an electrically driven vehicle. It merely means that the energy must be picked up from the wayside rather than carried on board.

If we recall the principal problems associated with present motor vehicle travel, to wit: congestion, pollution, safety, and immobility of the nondriver, the goal in developing an improved system should be to attack all these problems simultaneously, not merely one of them. This line of reasoning provides some very clear indications of the type of transport system which I believe we should be developing for the future.

1. The vehicles should closely resemble present automobiles and should offer the variety of prices and styles now available.

2. Individuals should be able to own, lease or even rent for a few minutes, the vehicles in this new system.

3. Operation on the main arteries should be under complete automatic control to permit higher traffic density, greater safety, and the possibility for automated parking and utilization by those currently unable to obtain a drivers license.

4. Propulsion should be by electric power to reduce pollution.

We believe such a system is technically feasible and could be demonstrated in a matter of a few years. Specifically, we envision standard automobiles, and small vans and trucks, modified by the addition of a pair of collector arms and of electric drive motors. These vehicles would operate on grade-separated guideways from which they would pick up electric power and control signals. Under automatic control we believe safe operation at speeds up to 80 or 90 mph, should be possible with spacing between vehicles of only 10 feet. Even at at 60 mph a single guideway of this type would have the capacity of 4 to 5 lanes of highway in one direction. Initially, at least, most of the vehicles would probably retain the gasoline engine as the means of propulsion for use between a terminal of the guideway and a person's home or point of business or recreation. As an alternative for those who would be satisfied with a vehicle capable of 30 miles range off the guideway at a top speed of 30 mph battery drive could be offered. Thus, off the guideway, vehicles would operate as cars do today with manual control.

Several years ago a group at M. I. T. went so far as to build a small demonstration guideway and to modify a standard car to demonstrate guideway operation. Figure 18 shows the way in which a standard automobile has been modified by the addition of a hydraulically operated arm which is lowered, as shown, to pick up power, control and steering commands from the guideway. Figure 19 shows the vehicle on the test guideway. A great deal more work must be done before a final configuration can be decided upon but I believe this design illustrates the general principles sought. In addition to serving as a substitute for the personal car on the expressway, an automated guideway system of this type also offers the possibility of use as a personalized transit system. Conventional size autos or minibuses operating under automatic control could provide complete freedom of scheduling and routing. Auto-like convenience could thus be afforded the nondriver if a means could be provided for him to get from his home to the guideway and to circulate within the central city. Concepts such as PERC* or MONO-CAB** could perform this latter function while a dynamically scheduled and routed bus system could satisfy the suburban collection distribution function. Such a system was proposed in 1966 by a student project group, which under my supervision, looked at the metropolitan transportation problem. They called their system GENIE. A continuation of that effort under the name of CARS (for Computer Aided Routing Systems)*** has been further investigated at M. I. T. and other groups have explored similar operations under such names as Dial-a-Bus.

*Project METRAN, M. I. T. Report No. 8, The M. I. T. Press, 1966
**See page 8 of this paper.
***CARS A Prototype Dial-A Bus System, Mass. Inst. of Tech. Urban Systems Laboratories, Cambridge, Mass., Sept., 1969

A period of design, test, and evaluation extending over several years must precede the design of a prototype, revenue, mixed-mode, automated transport system. However, the technical problems involved should yield to straight forward solution. Furthermore, while widespread adoption of such a system would cause some shift in the way in which this country uses and produces energy, the shift should be accommodated with a minimum of difficulty and with no strain on our natural resources.

In 1966, the U. S. produced approximately 1.15×10^{12} kwh of electric power and consumed approximately 75 billion gallons of motor vehicle fuel. If this fuel were converted to electric energy at 27 per cent over all efficiency it would be equivalent to 0.76×10^{12} kwh. Consequently, even if the order of 30 per cent of the vehicle miles in this country were ultimately accounted for on automated guideways the increased demand for electrical energy should be compatible with the growth pattern of the industry.

In my view, the real problem involved in implementing an automated guideway system lies in the start-up phase. While industry may be willing to support the initial technical development of a system, the Federal government will probably have to put up the money for a socially useful demonstration system. The $25-$100 million needed to build the first system will not come easily but the problems with our highways are becoming sufficiently acute and the inadequacies of conventional transit systems sufficiently apparent that transportation system planners are becoming more and more receptive to innovative schemes.

However, if the Federal Government does begin to play a larger role in supporting such innovative developments, it must develop better means for assessing local needs during the planning stage and for working with local groups.

The position of industry relative to the various levels of government must also be carefully appraised and means developed whereby private enterprise can be induced to play a more aggressive role in developing innovative transport systems while being protected from undue risk. Mixed public-private corporations might provide a mechanism for undertaking more risky but potentially higher payoff projects which could put really innovative forms of transportation to the test of the market place.*

*W. W. Seifert, et. al., "Investing in the Future of Transportation". Harvard Business Review, July-Aug. 1968.

Air Transportation

The program indicated that I would also say something about the potential of STOL aircraft. As airports become more and more busy, air traffic delays increase and neighboring communities become increasingly vocal in their opposition to any expansion of airport activities because of the noise created. The desire to handle the increasing traffic has forced airport operators to find new airport sites further and further from the cities the airports serve. This has made some additional airport construction possible, but has made airport access more and more time consuming.

An examination of the destinations served by a typical airport indicates that a large fraction of the traffic is accounted for within a radius of 250-300 miles. STOL, or short take-off and landing aircraft are neither flashy nor extraordinarily fast, but are particularly well suited to such short-haul flights. They do not use as much power and therefore generate less noise. Furthermore, they climb quickly and thus more quickly gain an altitude at which they cause little disturbance below. Since the runways required range from a few hundred to possibly 2000 feet, the land requirements are much less than for a CTOL port. This means STOL ports could be located close to cities.

In spite of these advantages, the STOL concept has not caught on. The airlines contend that seat mile operating costs for such vehicles are too high to permit them to make a profit. Furthermore, if their full potential is to be realized, they should operate in a separate ATC* environment below that of conventional planes. One might well blame the airplane manufacturers and the airlines for spending essentially no money to develop a satisfactory STOL plane. However, in view of the climate that has existed, this is not surprising. The Federal government supported, even if indirectly, the development of our present jets and has constructed and maintains the ATC system of the country. Except for a small contract to de Havilland of Canada, the government has not supported the development of STOL aircraft. This lack of support has been interpreted by private investors as a rejection of the concept and has had the influence of driving even private funding out of the area. There are some indications that this attitude by the government may change, but until it does, it appears unlikely that a truly efficient STOL vehicle will be developed.

*Air Traffic Control

In conclusion, I would like to state clearly that neither dual-mode nor STOL aircraft nor any other concept can be looked toward to provide the single solution to our transportation problems. However, several developments based upon the application of modern computer and control technology to the transport problem appear to offer the potential for major improvement providing systems utilizing these advances can be implemented.

In the longer term, the development and wide-scale implementation of a system in which vehicles very much like today's automobiles would be operated at high density and high speed on automated guideways but would retain the capacity to be driven manually on conventional streets and highways appears completely feasible. In the automated mode, this system would permit a several-fold increase in the number of vehicles a lane of highway could handle and a consequent reduction in the amount of land required for a highway. In addition, electrical drive would minimize pollution, and automation would increase safety while opening up the possibility for non-drivers to utilize the system. Such a system represents a major change, and its broad-scale implementation will undoubtedly require several decades. Furthermore, even such a system would not fill all our transport needs, and systems are now being developed which would interface well with an eventual automated system while serving an important function even before an automated system becomes available.

Conventional streets in the central city will continue to carry large volumes of traffic, but little possibility exists for widening these streets to relieve congestion. The only hope for speeding the flow of traffic along them, therefore, lies in reducing the delays at intersections. Toronto and New York City have installed centralized computer systems to control traffic lights over a wide area based upon measured traffic flow while other cities are experimenting with automatic signal control at individual intersections.

As air transport has grown in importance and airports have enlarged to accommodate the increased traffic, distances within airports have increased to such an extent that one may have to walk as much as one and one-half miles to change planes. Specialized transport systems are now being designed to serve airports and, further in the future, the core areas of our cities. These, again, will rely heavily on automation to provide rapid, re-

liable and inexpensive transportation.

Finally, in the less densely populated suburbs, an efficient and attractive system must be provided for transporting those who either cannot or choose not to drive. Again, modern computer and communications developments can be applied to free bus systems from operation on fixed schedules and along fixed routes and thereby provide an attractive solution to the suburban collection and distribution problem.

The technical capability to produce improved systems certainly exists. What is required now is the mustering of public and political support for development and demonstration programs to evaluate and further refine the most promising of the ideas that have been put forward. No short term solutions should be expected but, given time and money, significant improvements should be possible.

GEORGE WALD

MR. CHERMAYEFF: It is a great pleasure to introduce Dr. George Wald, whose distinguished career as a biologist began in 1927 when he left NYU with his first degree.

This was followed by further studies in Zurich, in Heidelburg in Berlin and the University of Chicago. He then was at Harvard and has been at Harvard since 1934.

His awards have been numerous and include the 1967 Nobel Prize in Physiology or Medicine shared with two others. He has been preoccupied for many years with the human eye and more recently, he has become preoccupied with human condition.

Through an interest in broad social and political matters, he has become a powerful spokesman for a more rational urbanism or for a better use or to eliminate the misuse of the earth.

This series of lectures has concerned itself with one urban issue, transportation, recognizing its critical importance in structuring the urban monster that we have created. And perhaps systems of moment, particularly exclusive of the car, can do more than provide an orderly framework for growth. Perhaps they can reinforce human social purposes like interchange, people talking to each other, relating to each other. And through this reinforcement, perhaps they can make our environment become more livable.

It seems very appropriate that we have been able to ask and have the acceptance of Dr. Wald, as a distinguished biologist, to comment on this notion, among others.

With great pleasure, Dr. Wald.

DR. WALD: I think you can all hear me without that, probably can't you? Mr. Chermayeff is a very persuasive person and architects and architecture are a big thing to me, so the combination was irresistible. And then I was handed a theme. My first thought was pure horror. I don't know anything about transportation, but I am beginning to get used to talking about things I don't know anything about, and so this is just another such occasion.

But this afternoon, I read through the letters I had from Peter Chermayeff and saw these magic words; "biology, community, transportation," and every now and then this irksome thought would come, What am I going to say to those architects? And I would write down a note or two, and I have little bits of paper here, but they probably aren't going to help much.

But I thought I owed you at least a little biology, so we will start there and see what we can make of it and then go on and shortly I will stop and let's just talk together and see where it ends up.

Now some years ago, as Mr. Chermayeff just told you, I had spent most of my scientific life working on vision, the chemistry of vision, and that has brought very prominently into my scientific life Vitamin A. In fact, it all started there for me. I found Vitamin A in the retina back in 1932.

And after awhile, I found that the visual pigments were made out of Vitamin A, and well, that just launched everything. So I have been working with Vitamin A a lot and still do.

But every now and then I grow restless and would like to expand my horizons, and in one such mad moment I thought Why not do something with Vitamin B?

DR. WALD: So that's where this enterprise begins. You see, at Harvard in the storeroom, we had some activity cages, rat activity cages. This is one of them. And in such an activity cage, you have a living compartment where the rat can live and its water and food are, and there is a little door which you can leave open if you choose and if you do, every now and then, at its own will, the rat goes through the door into a very carefully, nicely balanced, nicely hung wheel. And he runs. And as he runs, the number of revolutions are recorded on a counter. That's all there is to that.

Well, in our storeroom, there were a couple of dozen of these activity cages, and we have had for many years a system in which undergraduates can do research if they can get some professor to supervise them. A little Radcliffe girl had come who wanted to do a job. So, I thought, just the right job for a Radcliffe girl. You see, up to this point--and I don't know to what degree this is still true--but you see, it is very important for the big pharmaceutical houses to be able to measure the vitamin content of various foods, and one of the most important vitamins, from a human point of view, is thiamin, Vitamin B1.

And so, in all these pharmaceutical houses all over the world they keep big rat colonies going. The way this kind of thing was done was that you put a group of rats on a synthetic diet lacking thiamin, Vitamin B1, having everything in it but thiamin. Every morning a troop of girls would come to work and put on white coats and they would go down the line of cages and they would take out these rats. The test for thiamin deficiency, as described in the United States Pharmacopeia or any similar book of any advanced nation at that time, was that you picked a rat up by the tail, and held it over a table, and twirled it and dropped it. A good, healthy rat would just give you a dirty look and run off. But a rat that was in the early stages of thiamin deficiency would have a hard time recovering itself. It would struggle around a bit and it would be unbalanced and that was it. That was the sign of rat polyneuritis, a rat form of beriberi.

And at this point, you can begin to try out this unknown that you were interested in to see how much thiamin it had. You could begin to add various quantities to such rats and see how much it took to cure them, and that was the way one measured thiamin.

Well, you see, we are about to get to transportation. Because I already knew there was a lot of literature on what goes on if you put rats in such an activity cage. What happens is that a rat spends its whole day going through a fundamental rhythm, which is the fundamental rhythm of the life of an enormous number of creatures including man.

The way it goes with a rat in an activity cage is that you find this rat asleep; then it wakes up, goes through into the wheel, and runs awhile. Then as though it has suddenly thought of something else, it goes back in and eats. Then it goes to sleep. Then it runs. Then it eats. Then it sleeps. Then it runs. Then it eats. And it goes through the whole day this way in about a four-hour cycle.

And that is the fundamental rhythm of life for dogs and rabbits and anything--you name it--including, as I will show you shortly, people. That's where it all begins.

Now that is where I began, with this Radcliffe girl, because I thought, Gee, what we will do is take the thiamin away from such rats and with that, of course, they are not going to waste their lives in this senseless running. They will stop running; and with that, we will have a quick and quantitative sign, much earlier than by tail-twirling, of the first appearance of thiamin deficiency. That's what I asked her to do.

We would just put rats on a complete synthetic diet, then at a certain point pull out the thiamin, and watch what happened. Of course, on the thiamin-free diet they would stop running, because it would be an awfully foolish thing for a rat to run if it was going into a neuromuscular breakdown. Well, that's where I got fooled.

We used to talk at Harvard -- I haven't heard it lately -- of the so-called Harvard Law of Animal Behavior. It says, "Under the most carefully controlled conditions, an animal does as it damn pleases." And that's what happened this time, because to my amazement -- you see, we had these rats running with everything they needed including the thiamin, and then on a certain day we pulled out that thiamin, and within a few days, that rat which I had confidently expected to stop running just went into the wheel and ran itself to death, running 40 times as much as normally. I see that I have already got ahead of my story, so I will get to that rat shortly.

But now, back to transportation. We are still with rats in activity wheels and activity cages. The graph here comes out of the work of the laboratory of Professor Curt Richter in Johns Hopkins University. Richter's laboratory for years worked on rat activity, and what we have on this slide is the running, the number of revolutions run per day, against age in days of a lonesome female rat. This is a female rat living alone.

The curious thing is that such an animal, in a few hours of every fourth night, runs more than in the rest of the four days put together. You could establish a calendar by this running. You see that peak of running every four days. Once in awhile, it misses, but I wouldn't be surprised if something funny happened at Johns-Hopkins that day.

Just as one could set a calendar by the regularity of human female menstruation. There are these cycles built-in, and this one comes close to the menstrual cycle. This running on the fourth night is no mystery,because four days is the length of the gestrus cycle in the rat. Those few hours of every fourth night are the only time in the four days in which such a female is, as one says, in heat -- the only time in the four days in which that female would accept a male.

Now if you give her a male, this happens. You see here is the fourth day running, and then at this point, you introduce a male. The rats mate; and that's the end of the running. You now have a pregnant female. She doesn't run. Then she casts a litter. Now she is nursing the young. She still doesn't run. And then, as she weans the young, back comes the four-day running.

You may wonder how it is with males. They run all the time.

That brings us to my Radcliffe student and thiamin deficiency. Here we have the normal running of a male rat on a complete synthetic diet, including thiamin.

Since I don't have a speech for you, I would like the privilege of digressing frequently. It seems to me anyhow, that digressions are much more important than the speech. I would like to ppint out to you that our rats normally ran a lot less than Curt Richter's rats at Johns-Hopkins.

Why? The reason is very interesting, and it has its human equivalent. We are all sort of living programmed lives, and those of rats in a laboratory aren't so very different from thos of the people in the cities, or in the country, for that matter, in any advanced country.

In fact, the whole progress of an advanced country consists in the more perfect programming of lives. And so you see, though biologists talk fondly of the white rat as though it were one thing, as you go from laboratory to laboratory, in each of them you see these rats are highly inbred for years on end. You find that in each laboratory, until the professor retires, the rats in that laboratory are doing the professor's thing.

Curt Richter's rats in Johns Hopkins run a lot more than any old rat you can find. He is interested in running, and pretty soon his rats are all running like hell.

Ours were running at a rather low level. Then we pulled out the thiamin. Incidently, it was in this experiment that I learned for the first time what a vitamin really is. I had been teaching students about vitamins for years, but now I finally found out what they are about. Because you see, when we mixed the synthetic diet for those rats, when we got all through, we added one part per million by weight of thiamin. You felt like a damn fool while you were doing it because it was just nothing. You were just adding nothing. You thought Oh, hell, I am just going through a ritual, it can't make any difference; but Oh boy! You just leave out that one part per million of thiamin, and within three weeks, you had a dead rat. So that's the way vitamins are.

Anyhow, at this point, we pulled out the thiamin and now the surprise, the operation of the Harvard Law. The only sensible thing for that rat was to just go to a corner of the cage and sleep it off. You know, in the hope we would get bored with the experiment, the Radcliffe girl might get pregnant, anything.

But no, the rat, instead of that, goes into the wheel and runs, you see, just all day long. All day and all night. And, if you let these rats go far enough--and we would try to prevent that--but, if you let them go far enough, you'd find a rat in the morning dead in the wheel, and the counter would show that somehow that animal had struggled out a last mile in the previous night.

we put back the thiamin, and with that, the animal begins to eat its head off, and you see he is growing very rapidly, again, but the activity, the running is way, way down.

Well, that was a real expansion of horizons; so I thought, how about Vitamin B2? That is riboflavin.

So here are rats on a riboflavin experiment. First the complete diet with very low running. The broken lines are the control animals, siblings of the solid line animals. One day we pull out the riboflavin, the Vitamin B2, from the diet of the solid line animals. The broken line animals are still getting a complete diet, and their running remains very low; but the animals from whom we had taken the riboflavin, you see, are doing this enormous running. Meanwhile, their weight has plateaued and begun to drop.

Put back the riboflavin and the running stops, the animals are eating well, their weight goes up again. Does everything a rat needs in its diet produce this effect?

Not everything. For example, in this case, on this day, we pulled magnesium out of the diet. You can kill a rat by just removing magnesium from its diet. They become exceedingly sensitive to sound. In fact, you can get them to a point in which you can just come up to the cage and crumple some paper and the rat will go into convulsions and never come out. It is a very strange disease.

Here are the rats. First the controls, then the rats without magnesium. They have stopped growing, and begun to be sensitive; but the running has not fallen off compared with the controls.

So certain necessary elements of the diet, if the rat is deprived of them, cause this very strange response of running. Not all, but many.

But here it turns out that if you remove all the food from such rats, they respond with enormous running. If you take away their water, they respond with enormous running. If you take away both food and water -- but you can't keep that up very long and still have a rat -- they respond with enormous running.

What's this all about? Well, it is all about the other fundamental, deprivation. You take sex away from an animal, a possibility to go through reproductive activity, and strangely enough it runs. You take its food away, its water away, certain components of the diet that are absolutely essential, and strangely enough, it runs. This was a great surprise to me because it seemed to violate saying that all of you have heard that self-preservation is the first law of life.

This is just the opposite of self-preservation. No doubt these animals would last much longer if they just remained perfectly quiet, slept. They are doing just the wrong thing; and that's deeply mysterious. That drove me to the literature, and I learned something then which I hadn't dreamed of before. It is that through the entire animal kingdom, from the single-celled animals, the Protozoa, right up to man, the universal sign of hunger, in the sense of deprivation of food, is increased activity.

Now your first thought might be, well, that makes great sense. You see, those animals are looking for food. But this is not true. First of all, a rat is a lot smarter than to be fooled into doing this completely senseless running in a wheel and thinking it is looking for food. Rats are a lot smarter than that. They learn awfully fast. This is quitea different kind of thing.

Furthermore, biologists, when they were really interested many years ago in this kind of phenomenon, were doing all the necessary experiments to ask these questions. It turned out that when you feel sensations of hunger, those are the sensations of a particularly deep, slow kind of contraction at the upper end of the stomach, the so-called hunger contractions. It is when your stomach is going through these deep, slow contractions that you feel hungry.

So the question was asked, Are these animals responding to feeling of hunger? Well, you know, taking away an animal's thiamin is just the opposite of making it feel hungry. They stop eating. They lose all appetite. But beyond that, experiments were done with dogs and rabbits, that had their stomachs taken out surgically. They still ran when they were hungry.

Still more drastic experiments were performed in which the whole cerebral cortex of such animals was removed. They could not now experience any sensations as far as one could tell, and indeed, could not recognize food or feed themselves. Yet they ran when hungry. If you put food in the mouth, they swallowed it and went to sleep. But you had to feed them.

So these animals are not looking for food. They are driven to run. It is a kind of forced response. A hungry animal, an animal deprived of food, is forced to run. He is not asked to run; he is told.

And at this point, you must be asking, How did I ever come to say that that is in human behavior also? Because you might quite sensibly say, Gee, I don't run around when I'm hungry. Well, that's because you are civilized, as we say. You have been programmed properly.

Starting shortly after birth, you are taught not to do ostensibly foolish things. But actually, if you catch a human being in the raw, this behavior I have been describing for rats is exactly what human beings display. What do I mean by "a human being in the raw?" Well, for one thing, an uncivilized infant. Anybody who has grown up with a baby recognizes, particularly in the early stages before we program it, that a baby will wake up from sleep, start this fantastic hyperactivity, get red in the face, holler, writhe, throw its limbs all over the place. Then you feed it, and it falls asleep, frequently in the middle of the feeding. Then, a couple of hours later, it wakes up and goes through this cycle again. Given a chance, it would pursue such a four-hour cycle right through the 24 hours.

The problem for every young couple who has a baby is to break the baby into our thing, that Jerry Rubin calls our Fascist clock time. You know what that's like, and you know the work it takes to get a baby programmed to the point of sleeping for eight hours.

But that's the other trick. That's the other way to catch a human being in the raw; when he is asleep.

In the Johns Hopkins laboratory of Professor Richter, these experiments were done years ago in a happy period when the cheapest of all experimental animals were medical students.

Those were the days! I have had Harvard Graduate students on artificial, synthetic vitamin-deficient diets, because, damn it, if they hadn't eaten my vitamin deficient diets, they wouldn't have eaten at all.

They were graduate students. And, in this case, these were Johns Hopkins medical students who had been given that extraordinary privilege, a bed in the laboratory. They would have a place to sleep. They could sleep in the laboratory. Big deal.

What we have here in the time. Before going to bed, each of these students swallowed a baloon attached to a rubber tube that came out of their mouths and went to a mercury manometer that recorded throughout the night all the motions of their stomachs. The bed itself was very carefully hung so that any motion of the bed would be recorded. Here we have the stomach, and here we have the bed.

All right. First, everything is quiet. Then the stomach begins to go through these slow, deep hunger contractions, and with that, look at the bed. This student begins to toss around in bed. And then the contractions of the stomach fall off, and he is sleeping quietly again. Right through the night in a four-hour cycle, this thing happens. The medical student stays asleep, but the hunger contractions come every four hours or so, and with that, he tosses around restlessly in bed and burbles and groans, and so on. Then both the stomach and the medical student quiet down.

So it is as true for man fundamentally as for any other animal, that he is hyperactive when hungry.

As a matter of fact, as a result of these experiments, I realize what a fantastic thing is being done when one is asked to give an after-dinner speech. The absolutely basic response of any animal after eating is to sleep, and that's true of the guests at after-dinner speeches, too. It's just a struggle between the speaker and the guests. The guests want to sleep. It is the right thing to do, and there is that damn guy making noises.

This is really the fundamental pattern that is basic to all animal life, including man, and it makes one come to ask: Is there anything else that makes an animal move? We have talked of two things: sexual deprivation and the deprivation of food. Is there anything else? Well, not much.

That makes one wonder, Well, suppose I kept an animal thoroughly replete,

both sexually and nutritionally, would it move at all? Well, the answer is, it would move very little, and that, ladies and gentlemen, is where we are at, most of us. That's the game.

You understand that we don't go into running wheels to run. We don't even run around the block. As a response to either sexual or nutritional deprivation, we sublimate those impulses. As to what you do in the way of running in the sense of activity, work activity, all the activities you go through, they are in a sense primarily a sublimated form of these two tremendous, basic biological needs: the one that sees to it that reproduction continues, and the other that the animals survive to reproduce.

Now everything I have been saying to you so far is pretty much a digression, but it is good biology, I think. The curious thing is that what I have been showing in terms of the behavior of individuals also comes out in the much more impressive behavior of whole populations. Just as we have a sexually deprived rat running, a female in heat, a male at almost anytime, so one has the great reproductive migrations, many of which you know about. You all know about the spawning migration of salmon, when they come up from the sea and one has these travel folders showing them leaping up over falls. A spawning migration is quite a fantastic business. I have met a few of them. When you get a fish on a spawning migration, it just has nothing else on its mind.

As a usual thing, before the migration begins, it stops eating, and forever. It will never eat again. It's through with that. The digestive system usually collapses and becomes unable to assimilate food, so that if you poked food down the gullet of a spawning salmon, it wouldn't be able to use it. It has just got one thing left in life: to get upstream to the spawning grounds and spawn and die.

That's quite a journey, not merely in space, but in its hazards. The animals that reach the spawning grounds -- I am still talking salmon -- are utterly beaten. They are already dying. Their skins have been torn. The bears have been at them. The Indians have been at them. The canning industry has been at them. They are usually deeply diseased. They have beaten themselves to pieces in these jumps they have taken over falls. Every now and then, someone tosses in a dam or a hydroelectric development. Heaven knows how those animals manage still to get upstream, but it is their one end in life, and they are dying animals. That's the general pattern of such spawning migrations.

The migrations of the eels are among the most mysterious phenomena in all biology. All the eels of the shores of the Atlantic Ocean, both European and American, travel to an area of the Sargasso Sea, and area that includes Bermuda, to spawn. These are the so-called fresh-water eels. They have been living from five to 15 years in fresh water; and then when the time comes, they get ready for this journey, and part of the getting ready is a big anatomical change. Andpart of it is a complete degradation of the digestive system. Because before beginning this trip, mind you, from the shores of Europe; the shores of the Mediterranean, to the Sargasso Sea, that animal stops eating, and will never eat again. And now it goes from five to 15 years in fresh water to the deepest and saltiest region of the South Atlantic, the Sargasso Sea. There, at great depths, these animals spawn and die. And then the baby eels make their way back alone, unguided. How do they get back? No one know, or has even an idea.

It takes our own American species about 15 months to come to our shores and metamorphose into recognizable little baby eels and head upstream.

It takes the European baby eels three years to get back home. Those are two different species. There is no record of a baby eel ever having gotten balled up and going to the wrong place. We have no idea how all that happens.

Well, those are the great reproductive migrations, and, of course, there are the great hunger migrations. I think I have one more slide to show you and that's all.

In case you have never seen a picture of a lemming, that's a lemming. These hunger migrations involve almost any kind of animal that is hungry; where the food supply has become insufficient for the population. The lemming migrations just happen to have become almost mythical.

The lemmings are rather large rodents that live high up on the mountainsides in Norway. In a lemming year, which is likely to come every five to ten years, the lemmings descend from off the mountains in very large numbers. It is a myth that they travel together in great hordes, going through cities and stopping the traffic in the streets.

A lemming is a cute looking, but rather mean animal. No lemming will ordinarily tolerate more than one other lemming, of the opposite sex. When one such pair meets another, they growl at each other, and each pair goes its way. It is true of these animals, wandering away from their centers of population, that many of them reach the shore and start swimming out to sea, and that's the end of them. It isn't that they are looking for the sea to drown themselves in, because on the other side of the mountains that same wandering takes them across the plains of Lapland to die.

And now I want to talk about that curious paradox which I ran into with the Radcliffe girl and the rat. How is it that an animal does just the opposite of what might preserve it? Instead of behaving in a way that means self-preservation, it kills itself by running, by activity, by what seems to be a forced activity. What's that about?

I think that we know what the answer is by now. There is always that immediate thought, Ah yes, those lemmings are wandering away looking for food, but you see, there is no food for them. If there were another place for lemmings to live, they would already be living there. The truth of the matter is that colonization is not a possibility to these animals. The point of the migration is not to find new places to live, to colonize, because there are no such places. As the ecologists say, the niches are all already filled.

The point of the migration is not to find new places to live. The point of the migration is to remove by death the migrating animals. That's not to the advantage of the individuals, but to the advantage of the species. It is a kind of built-in biological altruism, in which this built-in behavior removes the individual to the advantage of the species. That's a very powerful and automatic way to deal with famine conditions, because you see, it is the animals that are most hungry that are most driven to wander off. And when enough of them have wandered off, there is enough food for those that remain. With that, the migration automatically ceases.

A thoroughly efficient way to go at this -- and it is a very curious thing that human beings, seeing these lemming migrations think of them as pathological behavior. You know, mass suicide.

Human beings are convinced that the normal way to deal with such situations is to go out and colonize. But for human beings, also, the niches are full; and colonization is done always by exterminating or enslaving the population already there. So that where lemmings go off to die, people go off to kill. And that we consider normal, and the lemmings, pathological.

There is much to be said for the lemming way of going about this problem. It involves no destruction. It involves a minimum of killing. And finally, though I always hate to say this, because you know I have been brought up in altruistic tradition -- it involves those lemmings going off to die which are doing most poorly; whereas, we send off to die and kill the flower of our youth. So the lemming way is in fact not pathological. Our way is.

And once again, you know, one finds with astonishment that also with men these patterns emerge nakedly for anyone to recognize. I want to read you a little passage from, of all thins, Herodotus history, in which he is describing the origin of the Greek games. What we now call the Olympic games. Just listen to it, because it has the whole pattern of what I have just been telling you.

Herodotus says, "In the region of Atys, son of Manes, there was a great famine throughout all Lydia. The Lydians bore the calamity patiently for some time, but seeing that it didn't stop, they set to work to devise remedies for the evil. The device adopted against the famine was to give up one day entirely to playing, so as not to feel any want of food, and the next day to eat and stop the game.

"In this manner, they continued for 18 years. As the affliction lasted and even became more grievous, the king divided the nation in half, and made the two portions draw lots, the one to stay, the other one to emigrate from the country."

It's the whole pattern. Running when hungry and then finally, the emigration. And that emigration either removed those people by getting them a new place to live, which would have necessarily meant a conquest, or sent them off to die. We are not told the end of that story.

My feelings about much of our society and its ways are quite full of rejection. We tend to rationalize a great many things that are becoming increasingly uncomfortable, some of them reaching the point of being intolerable. I would like to talk with you just quite informally about some of those things as they strike me, and then let's talk together. You see, we have accepted a kind of idea of progress, consoling ourselves by frequently defining as progress whatever happens. Almost unquestioningly. I think that most scientists and others by now realize that our species as well as our civilization are threatened with problems that are overwhelming in their magnitude, the like of which man has never had to face before. And in the case of one, no living species on this planet has really had to face before. That one is over-population.

We have actually, as biologists, defined fitness in the sense in which Darwin used the word in speaking of "the survival of the fittest," by reproductive success. We have said that any line of animals or plants we would consider most fit that produced the largest numbers of offspring that themselves survived to reproduce. I suppose that man is the first living species on the planet, animal or plant, that is threatened by his own reproductive success.

We have got about three and a half billion people on the earth now, and by all signs, that world population will have doubled by the end of the century. It is rather confidently expected that long before that, there will be famine on an unprecedented scale in many parts of the world. But terrible as that prospect is, it is not the heart of the problem. If it were, one could even take a little comfort from the fact that in the last ten years, world food supplies have increased a little more rapidly than population. But that's not the heart of the problem. To think that it is would be to concede that from here on out, the human enterprise, which has so much that is creative in it, that means so much, for which one has waited so long, because its history stretches back really to the beginnings of this galaxy, the solar system, billions of years of history go into reaching the point on this planet at which one has such a creature as man.

And for this now to turn into an exercise in simple production, to turn into the wholly meaningless enterprise of seeing how many people we can keep alive on the surface of the earth, would be utterly bankrupt, because no matter how well one managed that game, it would have to come to an end. But by then, human life would have become so degraded that there would be little worth saving.

I think that that is not a tolerable end for the human enterprise; that we are not really primarily concerned with just reproducing our numbers; that the real game is to improve the quality of human life. And if that is the point, and some of you may wish to argue it, I think that life has already deteriorated in quality, very considerably, not only in such places as China and India and Puerto Rico, but in Western Europe and the United States.

I think -- you may think quite differently -- that our art, our literature, our music, our poetry are not what they were something over a century or longer ago. And as for science, this period is kinder to science than to the arts, and yet the life of the individual scientist, I think, is a very poor thing compared with what it was a century and more ago.

I think of the quality and quantity of the production of a Charles Darwin or James Clark Maxwell. Those people had no labor-saving devices. If anyone of them had a secretary, one doesn't know about it. They seem to have written out all their work in longhand, and yet, my heavens! Darwin's opus fills a whole bookshelf, and every work is a masterpiece. Take any two or three of his books, and you have a Nobel laureate. And his writing go in every direction. Here is the author of the Origin of Species and the Descent of Man. So what business has that same man to write a book called Expression of the Emotions in Man and Animals? What business has that same man then to write a book on Climbing Plants? And what business has that same man to write a book on Insectivorous Plants? And what business had he to be a first-rate geologist, who wrote The Voyage of the Beagle?

It is just wild. It is like the life of five top present scientists. Nowadays, with secretaries and electronic typewriters and Dictaphones and computers and all the apparatus of saving time, so that none of us has any time whatsoever anymore, and of course since I am rambling, that's the way it has been with our transportation. You know, when transportation began to go faster, we were promised we would have more leisure. We would get there faster, so we would have more time to do our thing. Not at all. We just go further.

I am not giving you a very well connected speech. Part of the reason is that Monday I spent in the University of Indiana in Bloomington. Yesterday, I was at the United Nations in New York. Today I am here. I haven't looked at my calendar to find out where I will be tomorrow. I have time for nothing important.

So one has a feeling of being very seriously cheated, and I think that the quality of human life has already deteriorated very far. That gives me a sense of special urgency, becuase if it deteriorates much further, who is to save it? Who is to remember what life can be? The thing that cheers me up in the regard is that now and then, one finds oneself in a simpler society in which the transportation is not as efficient-- in which, in fact, people walk a bit. And one realizes that life then becomes rich and full and three dimentional in a way life is not for most of us.

People are beginning to be aware of this. I have just begun reading a book by Marcus Raskin, who is a bright and deep person, who says that people nowadays in our culture don't really live. They are lived. Living those programmed lives. Most of the business of schooling is to program lives. It starts earlier than that. It starts at birth, breaking in infants to feeding in accordance with the eight-hour day, you know; eight hours of sleep and then eight hours awake. It starts early and cuts deep.

So I will stop now shortly. This business of communication and transportation is a very strange one. One meets it at every side, and I must confess, for me usually, with a considerable measure of exasperation, I long for and I try to achieve as best I can a more meaningful existence in which I walk, preferably, to riding. If I ride, it is a bicycle, preferably to a car. If I must ride in something, rather a car, perhaps, than a plane.

The most boring, empty and meaningless of those means of transport is of course the plane. That's completely programmed. You are fixed to your seat, and fortunately, delivered rapidly. That raises another problem.

And I haven't thought about this enough to have a neat phrase, but it is an obvious enough thing, so it doesn't need a neat phrase, and that is what one accomplishes by moving. If we are not moving in order to hunt, to get food, to find a mate, then the best reason to move, it would seem to me, is to change one's environment. And that's becoming increasingly a problem. Because when I have gone three thousand miles at 660 miles an hour, I get out pretty much in the same environment I started in. And that's something for you ladies and gentlemen who are architects to worry about, because the most wonderful places that I have lived in my life are those in which I can change my environment by just walking.

The only time I ever took a sabbetical, I spent it in Cambridge, England. Cambridge University, in some ways, represented the highest intellectual standards that I have ever been exposed to, including those at Harvard. But that isn't what draws me back to Cambridge. I'll tell you what draws me back to Cambridge. I was working very hard. I was experimenting -- when I got tired, I could walk out of my laboratory and in five minutes, I would be walking along green fields, among grazing cows and horses, beside a quiet river. And if I walked two miles, I reached Granchester and could have tea in an apple orchard; and then I could walk back.

Frequently, I chose not to walk and punted up that river. Now punting is another delight. You work your body, and it is just marvelous. It is that business of poling a flat boat along -- you know, it is a very shallow river and you just dig your pole in and push, and pull your pole up, and give it another push. It is an utter delight. And there you are standing barefoot on your flat-bottom boat and get yourself up Granchester and go to a pub and have a beer or go to that apple orchard and have tea. Those are wonderful things, and you see, they don't exist in my life here.

I can't walk out of Cambridge, Massachusetts and have that. It is just walking in smog, and where does it get me?

If I want to take a walk in the woods, what do I have to do? I have to get in a car and compete with everybody else in cars because people aren't just going places in cars, they are displaying their machismo. A car is a sort of amplified male sex organ and so you have to sort of hold your own.

Anyhow, you go to Concord, you know, drive 20 miles, and it is not all that good--walking there. A lot of other people have had the same idea. It's pretty poor. And, this business of making it possible to walk one's way through a varied environment, to change one's environment, and change it continuously on one's own feet--that's a big thing. And if one could design that into a city of the future, that's a beautiful thing.

One of the most wretched things I have ever seen happen in American cities is so-called urban renewal. The forms in which I have seen it are utterly ghastly. The form it has taken in Boston -- well, it gives us a place to demonstrate against the government, but I don't know much else to say for it.

And yet, I once experienced a bit of urban renewal that was just wonderful, just marvelous, that just made me so envious. And that was what was done with the bombed-out center of Rotterdam. I don't know whether any of you have ever seen it. But that was turned into a walking mall. No cars get in there, and there are just wide streets, and people just walking, and you can--in the summer--stop and have a drink, or a cup of coffee right out on the street, and all the shops--and you window shop and you meet your friends . . And it is just beautiful. And you are away from cars and that kind of walking space from which the cars are excluded. Terribly important

Harvard is a dreadful place by now and gowing increasingly dreadful every day. When I came to Harvard 37 years ago -- a long time -- you had thoughts that you were in a place somewhat like Oxford or Cambridge. Nobody has those feelings any more. It is much more like the University of London, and you know, it is sort of ghastly that when one gets a Corbusier building, one sticks it into a little nook where nobody can get off far enough to really get a look at it; let alone of that building, which is sort of a showpiece of its own; sort of a complete frustration of what is supposed to happen in there, which is to express more art. There is no place to do that at Harvard, to my shame.

I have just been writing Derek Bok new president of Harvard about it. There is no place at Harvard in which a student can do something with his hands, excepting for the science laboratories. There is no place for a student to paint a picture, make a pot, make something out of wood. There is no shop. There is no studio. It is the most arid place, from this point of view, that one can imagine. I have worked on this for years. There was a big opportunity, when there was a Committee on the Visual Arts, and I was the only outsider. I don't know how I ever got on that thing, but there I was. So I thought, Here's my chance. So I kept clumping for this, you see -- the studios -- to bring artists to Harvard, to get a little creation going on there. Not just the bandying of words. What I got was a Corbusier building.

It is kind of a goldfish bowl, and I am afraid pretty empty and much too beautiful a place to make a mess in. And anybody who is going to make something with his hands is going to make a mess.

So I think that is sort of where I come out. I want those options that don't exist now. I want a place in which I can walk through a varied environment, in air fit to breathe. And what makes that varied environment is plants and animals and people. and people doing all kinds of different things. I go to Mexico every year, come hell or high water. Never very long, because I don't have much time; but every year. I get out of Mexico City, which is just another ghastly city, as fast as I can and go into the back country. But as soon as you get out of Mexico City, even into another reasonably large city in Mexico, you can still live some kind of decent three-dimensional varied life.

Caxaca is likely to be my first stop because I have friends there. And there I live for awhile in a beautiful garden, and as I step out into the road, there is always a lot going on. There are burros passing, carrying firewood or there are goats or sheep that some kid is driving past. I hear a characteristic noise

right across the way. The doors are open, so I stick my head in, and there is a whole family weaving. The mother is spinning the thread, and the kids are helping in various ways, dyeing and so on. And the man and his son both are working away on homemade looms. And right in the next shop with the door open, leather things are being made. And in the next shop, furniture is being made.

On that little street, one can supply, except for food, many of the basic necessities of life. One can live a complete three-dimensional life, with no department stores, with just neighbors. And walking down the street, there are people who can do almost anything that you need to have done.

And that makes a rich life, and that's what our young students are desperately trying to find again; a life like that that is meaningful and varied; in which people are doing meaningful work of various kinds, and in which one can walk through that kind of a varied environment.

The next best thing would be perhaps to use a bicycle to get there a little more quickly. But if you go a step further, you have begun to ruin things.

Incidently, along with that kind of life one needs another thing which is very, very serious in America and that is adequate public transportation. We don't have it at all anymore. Why? Because it doesn't pay. We have a sick society on our hands, in which work needn't be anything useful, it can even be utterly destructive and antisocial. Work is what you are paid for doing. Similarly, the decision as to whether to have transportation or not is based on, Will it pay? Not, Is it needed? But, will it pay?

I do my summer work in a laboratory in Wood's Hole on Cape Cod. Years ago, the trains that used to come into Wood's Hole from Boston and New York stopped coming. And by now, the railroad tracks have been torn up. Well, first of all, they have been turned into a parking lot and the rest of it, we have to see if we can protect from becoming a real estate development.

But no more trains. Why? They were needed. But they didn't pay. That's the way we go at these things.

What does pay is to force every American to have a car. The idea that a car is a luxury in American life is a laugh. An awful lot of Americans need a car, not only to get to work, but to get their kids to school. We have a car civilization, because that pays; and those cars are turning our world into a fantastically ugly thing. I'm not talking of the fields of junk cars, which are as though a bombing had occurred in areas where you see them. I am talking about the cars going through our streets. How can one be an architect and put up a decent building or design an environment and have these acres of parked cars clotting up everything. And the more of them there are, the more slowly they go. They have become a complete frustration, and they are poisoning our air.

So there is a lot to do and we need fewer cars on the road, much more adequate public transportation, and most of all, those communal, intimate, varied three-dimensional environments in which people are living with one another and can walk from one place to another.

I'm sorry to have kept you so long. Who wants to talk?

MR. CHERMAYEFF: We hope there will be questions, really. Let's have a lively discussion and everyone is invited to have a bit of coffee afterwards.

FROM THE FLOOR: There is a parallel that one can't help but think a little about. I hope that you can dissuade the pessimism. There is a parallel between our progress and what the lemmings do.

DR. WALD: Well, there are parallels, of course. And they have become rather frightening lately. You have probably heard about a lot of the problems, but you may not have heard about this one. But it is beginning to come up and it is a first-rate one, but so deeply uncomfortable, one hardly likes to talk about it.

Let me say it positively first. We need a complete redefinition, a new conceptualization of what constitutes useful work.

Our present concept is that work is what you are paid for, no other questions asked. The truth of the matter is that with our booming technology that has even invaded, by now, agriculture very heavily, and our rapidly increasing population, there is less and less work for human hands, for human musculature, to do in the world; and there is more and more of that musculature.

It is at present estimated that there are about five hundred million persons in the world who are not just unemployed, but for whom there is no work. For whom there is no use, in our present ways of doing things. They are spoken of as "marginal man;" and the estimate is that by 1980, there will be a billion, and by 1990, two billion.

And you just think about that. The present world population is three and a half billion. Five hundred million "marginalmen" already in the world, is more than twice the population of the United States. This explains a little bit something that might have puzzled you otherwise if you had run into it.

You see, I feel that population control is absolutely essential. Hence, I am a little dismayed and mystified to find that this thought of population control is met in some quarters with the cry "germicide." The very poor and the blacks who seem most to need population control, often meet the idea with rejection, calling it germicide. Similarly, the underdeveloped nations that seem most to need population control, meet this idea very frequently with this same cry. "It is germicide you are proposing."

When I first heard that, that seemed crazy to me. The other thing that bothered me was that in all my passion for population control -- so that I joined every organization that has the word population in it -- I found myself thrown together with what seemed to me strange bedfellows. Persons I didn't ordinarily find myself in bed with, like John D. Rockefeller, III or David Rockefeller of the National City Bank. It turns out that Standard Oil of New Jersey is dreadfully interested in population control. That makes me sort of uneasy. I begin to ask myself, Why are they so much for this?

Well, I have just told you why. The simple truth of the matter is that from the corporate point of view, there are too many people in the world. There is no use for them. One isn't interested in them as markets, and one has no use for them as muscles. Meanwhile, they are making demands. They want food and clothes and education, and they watch TV occasionally and see how the other half lives. They have become an embarrassment. One would like to get rid of them. That's true, in our own South, as you know, where for example, Senator Stennis -- who owns a big plantation, and draws about $150,000 a year for not planting crops -- well, when he does plant, it's all mechanized. Those tenant farmers who used to do his work, you see, he has no more use for them. They are an embarrassment.

One is trying to starve out large numbers of blacks who used to do agricultural work in the South. It isn't that they are unemployed. There is no use for them. One way of getting them to wander into the cities is to starve them out. The President's Nutrition Commission has told us officially as of December 4, 1969, that 10 to 20 million

Americans regularly go hungry. A lot of them are these people, both black and poor white.

So I think you have good reason to feel depressed with this situation. It's altogether too close to the lemmings.

FROM THE FLOOR: The human species has existed for a couple of million years. What has happened in the last four or five hundred years for this rapid increase in population?

DR. WALD: Well, one of the big things that has happened of course, is the industrial revolution. That introduced a degree of efficiency, and the distribution of food and goods that permitted this enormous leap in population. It has happened all over the world.

I don't feel depressed. I do not feel despair because, knowing what the cosmic history that led to man is, what a tremendous game it has been, how long it has taken, it seems utterly inconveivable to me that we give up now, for what are essentially trivial reasons, because all these problems can be dealt with. And one could make a fine and open and decent life for man on the earth that would permit him to go a long way toward realizing his potentialities.

One of the things that gives me hope is that our culture has taken a wrong turn so recently. Out of two million years of man on the earth, up until a few hundred years ago, the whole pattern of human existence was small village life, in which men lived in symbiosis with animals and plants to mutual advantage. It was good for the plants. It was good for the animals. And it was good for man. They were all getting along.

Once in awhile, something wretched would happen that would create a desert. But on the whole, things were pretty well in balance. It is only roughly since 1800 that the industrial revolution came in that began to devastate the earth and human life. I don't say we should go back to life as it was in 1800, but I think we need to reconnect with that life, and go on from there in a fresh start, as though these dreadful mistakes that plague us now had never occurred.

FROM THE FLOOR: If the population, through some manner or form, could be controlled at either the present level or the level of twice as much as we have now, do you think it is technologically possible with the present population figures to solve all these problems? In other words, the environmental problems.

DR. WALD: You know, if I could dictate a solution, I would have considerably fewer people in the world than we have now, though the chance of achieving that by any means is exceedingly small.

On the other hand, one of our greatest threats is that of nuclear war. It is sometimes horrifying to see the gleam come into the eyes of someone who hears thses two things said together and thinks, Gee let's let one problem solve the other.

That may be the way it happens, but it is no long-term solution. At the present rate of human increase, unless we then drastically alter the whole scheme of things, the economic system and so on, we would have to have such a nuclear war about once every 20 to 30 years. Hardly a pleasant prospect, and sort of playing Russian roulette with the human race.

But I don't know any of these problems that is unsolvable -- and you know, one keeps asking for more research, and that's fine. One needs more research. There is an awful lot we don't know. What we don't know is a lot more than what we do. And yet, we know enough to act in many of these directions, and we should.

The problem is not to know what to do, but to do it. Right now, for example we ought already to have available, universally, all over the world, cheap or much more preferably free, and safe, and convenient means of both contraception and abortion. We should, as rapidly as possible, reach a state in which no where in the world need a woman have an unwanted child. None of us knows whether that would do adequately the job of controlling population, but it would be good to find out. If that didn't do the job, then there are numbers of other humane, reasonable things to do that would go further.

Our pollution problems could be dealt with; but, again, they are unlikely to without a very drastic change in direction. The only reasonable way to deal with pollution is to stop it at its source. A much more likely thing to happen in our present society is to let the pollution continue, and build on top of it a new, multi-billion dollar, and ultimately tax-supported industry on anti-pollution.

If you want to stop pollution at its source, you go up against tremendous corporate forces. The biggest air polluters are the motor cars. That brings you up against the motor industry, and gas and oil. Then there's the lumber industry; that has a big lobby too. Another tremendous polluter is the power industry. That has a powerful lobby, too. Some of our favorite politicians deliver very eloquent speeches about the environment; but you ask them what they intend to do about it, and you find that all at once things have grown very tentative. The easy solution under these circumstances, the solution furthermore, that will keep the campaign funds rolling in, is to let the pollution go on, just build that big new multi-billion dollar anti-pollution industry. And in these days of conglomerates, it will end up being the same business: one division will pollute, and the other division will clean up; and they will both make a lot of money.

So it is not that one doesn't know the right thing to do, but we are not in a world in which the thing that will most benefit society is what gets done. Policy is decided very frequently on other grounds.

FROM THE FLOOR: You are among some of the more eloquent people in the world and perhaps you could tell us, how do the majority of your colleagues feel about these kinds of problems?

DR. WALD: I don't know. I do know in the case of some of my colleagues, but you are asking for a statistical statement, and there I don't know at all. I think that most of my colleagues are on the side of the angels as regards peace, pollution, and population. All the things that begin with P.

But they can be bought off. And quite cheaply. I have been a member for many years of the most elite scientists' organization in the country, the National Academy of Sciences. Some of us are dreadfully worried because for years now, the National Academy of Sciences has been working very closely with the Department of Defense. It actually does secret research, secret from the membership. And in the last bulletin I had -- they have a sort of newsletter -- in the last bulletin I had, I was horrified to see that the National Academy of Sciences is about to undertake an investigation of the effects of the use of herbicides and defoliants in Viet Nam with $50,000 from the Department of Defense. And the Department of Defense is where the National Academy of Sciences, when it gets through, will deposit its report. And that will be released or not released by the Department of Defense.

That is strange behavior, you would say, for an organization mainly of university scientists. They wouldn't behave that way individually, I think, but people do this kind of thing collectively. You see, there is a big payoff promised. Play ball with the administration, and there will be more funds for research and science. Well, it is an unselfish thing. It doesn't mean bigger salaries. It means more money for research. Doing that research represents a very idealistic endeavor, so you are trading ideals, you see. You are surrendering one ideal to promote another.

FROM THE FLOOR: I think it was Rene Dubos who advanced the idea that perhaps man has so perfected his ability to adapt to his environment that he can adapt far longer than environment is able to support a viable life.

How do you feel about whether or not he can continue to function without becoming alarmed at changing his environment?

DR. WALD: Well, you are talking now about psychological adaptation, not physical adaptation.

FROM THE FLOOR: Yes.

DR. WALD: The environment is reaching the point at which it is becoming more and more difficult to adapt to it physically, and it is really punishing people. You know, as I understand it, one is told over the radio in New York -- and by now, some other American cities, Los Angeles, I think -- whether you can afford to breathe on the street that day. Try to restrain your activity today. The levels of smog are too high. You shouldn't get out of breath. That kind of thing. And you see, all these things are growing worse all the time.

I think that the adaptation Rene Dubos must have been speaking of is the capacity to get used to any damned thing, and that is what we need most to struggle against. The apathy that consists in having got used to things, however bad and having lost the capacity to say No. Down at the Washington rally on April 24, I was handed a nice black button. I gave it to my wife. But I wish I had several. It just says "Enough." A nice button.

FROM THE FLOOR: This word "control" is a very interesting one because I think if we leave it undefined, we can get all kinds of agreement on the matter of population control, which is a very serious problem, no question about it. I think we all agree to that. But when it gets down to the definition of control, I think this is where the human aspect comes in.

I am sure that the National Academy of Sciences, even those concerned with population growth, probably couldn't come to agreement on whether it should be a negative growth, a positive growth or just staying at zero.

I wonder if there is anything we can draw from the experience of the lower species. None of the lower species have consciously set about some way of controlling growth. It has come from some force that is beyond us.

So aren't we being presumptuous to say that the human mind, in its present state, can define this?

DR. WALD: No. Having made a thoroughly artificial environment, which means that it is man-made, we have to take these things into our hands. It is a remorseless kind of process that can't be evaded. We long ago stopped being the passive creatures of natural selection processes.

You know, natural selection works very well, and animals' instincts take beautiful care of them. The whole parable in the opening paragraphs of the Book of Genesis, that eating the forbidden fruit of the tree of the knowledge of good and evil, really, I think the whole meaning is that man removed himself from the safeguards of instinctual life. He took his life into his own hands; and hence God's curse, if you wish to see it that way.

But that is also the source of our freedom, our ability to chose to a degree what we do. Animals are taken care of by instinctual forces, "drives" and so on.

The lemmings are assured that lemmings are going to go on, because automatically, every four to ten years, there is an over supply of lemmings, and that automatically drives off a lot of lemmings to die. They don't make war. They don't get into uniforms. Nobody holds speeches. They don't give one another medals. They just go off and die. That's the end of them.

The ones that stay behind then have enough food. And that's the way nature takes care of animals in general. And incidently, it isn't a cruel kind of process. One of the strangest things that we have done is to project all our worst human impulses onto the animal world. The big thing in biology nowadays is what's called ethology, the science of animal behavior. And the big thing there that students are piling into is to go out in the wild and study the behavior of animals in the wild. The curious thing is that the message that is coming back, very surprisingly, is always the same: The animals are gentle. The gorillas are gentle. When male gorillas hammer on their chests, they are not about to tear up a person or another gorilla; they are just displaying, and then usually each goes his way.

The chimpanzees are gentle. The wolves are gentle. Killer whales do little killing. Lions are gentle. The message is coming back all the time that way.

There is nothing else like man in the world. He has eaten that forbidden fruit, and he is on his own, and we are making amess of things. So I don't think it is presumptuous to decide to do it another way. I think we really have to begin to exercise controls, where our development has gotten out of hand.

FROM THE FLOOR: Do you think that maybe we have a continual state of imperfection that actually helps to provide a sense of purpose that men need? I am not convinced that the condition of life was that much better a hundred years ago for the people that lived in the preindustrial revolution or the industrial revolution.

In Darwin's time, there were lots of people that lived in misery.

DR. WALD: Yes, I know. I have been brought up on the same rhetoric. One is told Yes, indeed, the symphonies aren't as good as in Beethoven's day but there are more calories. It's a strange deal.

One would like both the calories and the symphonies. Why not? Why make that trade? I try not to be sentimental about these things, not to deal in myths. I nevertheless think that there is some reality in the goodness of life of those village Mexicans as compared with those sharing much the same economic level in an American slum, or a Mexican slum. That's what the trade has been for those people.

I think one of the strangest paradoxes -- and again, you may say, Oh yeah, a middle-class American being sentimental; just try to live that way -- is the sense of relief one feels in finding oneself in what we think of as a poor country as compared with an affluent country. I am thinking not only of Mexico, but Greece or Italy. Not so

much Italy. I just came back from a first trip to Sicily a week and a half ago. There are large sections which are devastated. They have lost their country without achieving a city. Large sections of Sicily have been exploited in a most wretched way, and makes for a wretched life.

I don't think this is sentimentality. What I think of as the good life is what a rather astonishing number of my students now are seeking in preference to trying to make it, in the way Harvard students tried to make it up to say ten years ago. It is curious how many of them are beginning to wander back into the abandoned farm country of New England taking up much simpler and less highly technologized lives.

FROM THE FLOOR: The criticism of the quality of life that we have in our cities, and probably this applies to all of the Western countries, sometimes alludes to the other side of the coin, the suburban life.

Now Lewis Mumford said something -- I can't do anything but paraphrase -- but it had something to do with the fact that if medieval Europe was organized like middle-American suburbia, there would have been no civilization. You don't really find any answer in suburbia.

DR. WALD: Not at all. No. That is almost the final frustration.

Incidently, the thing that is most rejected by those kids I teach -- the last thing in the world they could see as an end in life -- is the very thing that was the promise of life for Harvard students up to say ten years ago. That is the house in a good suburb, with two cars in the garage, and the kids going to good private schools; and when you got through paying the mortgage, you wrote checks to good causes. That was life in the pure. My students don't see that as something they desire any longer.

I wonder if we shouldn't have a coffee.

MR. CHERMAYEFF: Thank you very much, Doctor.

BIOGRAPHIES

SERGE CHERMAYEFF

Serge Chermayeff was Professor of Architecture at Yale University from 1962-1969. He is well known in academia as Professor of Architecture at the Harvard Graduate School of Design and as the President of the Institute of Design, Chicago. He has had a distinguished career as a practitioner, and was made an Honorary Fellow of the Association of Columbian Architects, S. A., and a Fellow of the R. I. B. A. Professor Chermayeff is the author of the important book, "Community and Privacy," and has a new book currently at press, "Shape of Community."

ALAN ALTSCHULER

Dr. Altschuler is a Professor of Political Science at MIT. He is currently Transportation Advisor to Governor Sargent and in the recent past was Chairman of the Governor's Task Force on Transportation. He was a member of President Nixon's Task Force on Urban Affairs. Professor Altschuler is the author of "The City Planning Process: a Political Analysis"; "Community Control: The Black Demand for Participation in Large American Cities", and numerous other papers and reports on transportation and transportation policy.

ARCHIBALD ROGERS

Archibald Rogers, FAIA, is Chairman of the Board of Rogers, Taliaferro, Kostritsky, Lamb (RTKL Inc.), Baltimore. He is Partner-in-charge of planning for various urban centers: Dayton, Hartford, Ithaca (N. Y.), the Capital City Plan, (Albany, N. Y.), Cincinnati, and others. He is the author of numerous publications: "Toward an Expressive School Architecture"; "Baltimore's Charles Center"; "Urban Design: The New Architecture"; "Russian Reconnaissance: Stresses of Change"; "...Building an Environment That is Right for People". Mr. Rogers has served on numerous design juries, and his firm has received many design honor awards.

DAVID CRANE

David Crane is Principal in the firm under his name and Professor of Urban Design at the University of Pennsylvania. For many years he has been involved in experimental projects, teaching, writing and extensive lecturing. His work has led him to design innovation at many levels. He was Director of Land Planning and Design for the BRA from 1961-65, which included being Chief Planner and Design Official at the head of a 120-man Planning Department under Ed Logue. He is the author of the 1965-75 General Plan for the City of Boston and the Regional Core; "Planning and Design in New York"; "Architecture and the Urban Revolution"; and many others. He is a member of the AIA, AIP and NAAB.

WILLIAM SEIFERT

William W. Seifert is a Professor of Electrical Engineering, Professor of Engineering in Civil Engineering and Director of Project Transport at M. I. T. Since 1964 Project Transport has carried out a continuing program of research in support of the office of High Speed Ground Transportation in the U. S. Department of Transportation. They have also studied long-range, in-depth means of improving the safety and efficiency of highway transportation. He has written reports on the roles of public and private enterprise in transportation and on its future. He is the author of Air Transportation, 1975 and Beyond: Control Systems' Engineering; and numerous technical reports and articles.

GEORGE WALD

Dr. Wald is the Higgins Professor of Biology at Harvard. In 1967 he was awarded the Nobel Prize in Physiology or Medicine, jointly with Drs. Hartline and Granit. He was elected to the National Academy of Sciences and is a Fellow of the American Academy of Arts and Sciences in Boston. In 1963-64 he was a Guggenheim Fellow in England. Recently, Dr. Wald has been a sympathetic spokesman for young people and has spoken articulately on issues of social and political significance.

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